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ERRATA.

Page 265, fifth line from bottom, read "*Mucidines.*"

For the word "cellulose," *read* "cellular," pages 271, 276, 278, 280, and 283.

Page 475, seventh line from top, *for* "P. MULTIFLORA" *read* "P. MINUTIFLORA"; and on same page, third line from bottom, *delete* "(nomen nudum)"

Page 514, seventh line from top, delete "*C. gibbosa,* Ridley, *l. c.*"

Page 632, from a certain similarity in appearance, the woodcuts fig. 10 and fig. 15 have accidentally got transposed.

THE JOURNAL

OF

THE LINNEAN SOCIETY.

On the Indian Species of *Cyperus*; with Remarks on some others that specially illustrate the Subdivisions of the Genus. By C. B. CLARKE, F.R.S., F.L.S.

[Read March 6, 1884.]

(PLATES I.–IV.)

DURING the last two months I was at Kew I was employed in revising and re-sorting the Indian species of *Cyperus* in that Herbarium. In the first half of the genus I was able to look up the synonymy and note the geography pretty fully, and to compare a considerable number of the non-Indian species. In the latter half of the genus, though I was able to sort and examine the Indian material, I was too much pressed by time to be able to write down much. Nevertheless, on leaving for India, Sir J. D. Hooker expressed a wish that I would publish my work on Indian *Cyperus* in some form, as it might assist another day in the elaboration of the genus for the 'Flora of British India.'

Since arriving at Calcutta I have been able, through the kindness of Dr. G. King, to compare the Calcutta Herbarium, which is immensely rich in Indian material; and I have been able to nearly complete the paper, so far as the description of the Indian species is concerned; but in the latter half of the genus I have been unable to touch the synonymy (there is not here even a copy of Bentham's 'Flora Australiensis,' so that I have been obliged to employ MS. names of F. Mueller probably long ago superseded); nor have I been able to give much account of geography beyond the limits of India, nor to compare (and illustrate subdivisions with) many African or American species, except a few very well-known ones. The present paper, therefore, in these respects, presents a gradual tailing off.

The Society may fairly ask me, why, then, publish so unequal a paper? And my reply is, because it contains a good deal of work, and because many years must elapse before I can hope to make it more complete. Of course I may never be able to add any thing to it. All papers, at least of a systematic kind, prepared in Asia, Africa, or America, must be, as literary work, very poor performances in the eyes of botanists in the herbaria of London, Paris, and Geneva; but it has not been, I believe, hitherto the system of the Linnean Society to reject, on the score of incompleteness, any paper that contains additions to the sum of scientific knowledge. And the most highly-finished systematic papers of European botanists are often, though in form perfect, extremely incomplete really: completion and finality are alike in such work unattainable.

In this paper Sect. I. is the result of taking each part of a *Cyperus*, culm, inflorescence, &c., and comparing it in all the Indian species; Sect. II. contains a discussion of some difficult species and disputed genera; Sect. III. is a systematic arrangement, with descriptions of the Indian species, with short citations of some non-Indian species that more particularly illustrate the subdivisions and groups.

SECTION I.

(1) THE RHIZOME.

There are two classes of *Cyperus*, viz. (1) strictly annual, with fibrous roots; (2) biennial or perennial, or with a horizontal rhizome. In this second case the rhizome may be (in the same species) very short, with very short nodes and cæspitose culms, or the stolons may be elongate, developing into creeping rhizomes with long joints and distant solitary culms.

Of the second class, a few species appear to flower sometimes in the first season, and examples of such in the herbarium cannot be distinguished from annuals. The regular annual species, once-flowering, such as *Cyperus pumilus*, I have never known to produce stolons or seen with a woody rhizome; though it is not improbable that if prevented flowering, by a jungle-fire or otherwise, just when shooting for bloom, they might take on a different habit, and live to flower in the next season.

At each node of the rhizome there is normally a scale, often 1–2 centim. long, usually slate-coloured or black-brown, almost scarious in texture, lanceolate or sometimes almost ovate, sometimes almost linear. In the figures which I give I have removed these, partly because the essential features of the rhizome can be more distinctly shown, partly because I am not artist enough to draw them properly, and can only attempt pictures virtually "diagrammatic."

Figs. 20 and 21 represent two states of the rhizome of *C. lævigatus*, Linn., which may be seen in one plant at Suez: on the dry sandy bank the nodes of the rhizome are very short, very tough, the plant rigid, with white spikelets usually (fig. 20); but directly the same rhizome touches the brackish pools adjacent, it commences to run freely (as in fig. 21), the rhizome becomes supple, the spikes become generally chestnut-purple. When the same rhizome floats out on the sweet-water canal, the culms become dwarfed, with often only 1 or 2–3 spikelets.

Boeckeler has founded two new species (*C. viridulus* and *C. reptans*) on Peruvian plants which I have seen, and which differ from *C. lævigatus* only in habit, and in habit scarcely more than *C. lævigatus* varies in itself. I doubt whether they may not be merely geographic forms of *C. lævigatus*. At all events, both from the example of *C. lævigatus* and from many other well-known species, I think it is to be inferred that a difference in rhizome alone (supposing the plant not annual) is insufficient ground for specific separation. In *C. umbellatus*, Benth., in the type form alone, we have cæspitose fibrous roots, or a short thick woody rhizome, or long slender stolons becoming ultimately tough black slender rhizomes.

I propose to separate specifically all the annuals from the others. The only difficulty arising is in the case of *C. Haspan*. This has typically an elongate rhizome, the result of stolons (fig. 23); but we frequently have, as Boeckeler says, the rhizome exceedingly short (fig. 24); and beyond this we have flowering and fruiting examples, apparently annuals, with no trace of a rhizome. I must allow these, though I separate specifically as *C. flavidus*, Retz., a large portion of Boeckeler's *C. Haspan*, which indeed he has subsequently made the new species *C. microcarpus*, Boeck. *C. flavidus*, I believe, never exists more than six months; it is one of the universal annuals in late dibbled rice, the culms are often clustered with tangled fibrous roots, and appear sometimes to grow together (fig. 25); but I have never seen any thing like a rhizome in this species.

But though there are these (and other) difficulties in employing the general characters of the rhizome for the discrimination of species, the particular characters of the rhizome are in many species exceedingly constant for that species, and in some cases afford the best specific character we have.

In *C. rotundus*, Linn. (fig. 16), the culm arises from a nodule of the rhizome, the remainder of the rhizome being slender wiry; the nodule is formed by a number of shortened joints of the rhizome, secreting much starch, whence the strain on the plant caused by fruiting is met.

In *C. longus* (fig. 14) the rhizome is nearly uniformly thick; there are no very prominent nodules whence the culms spring, nor any very slender wiry portions between. I confidently refer Aitchison's n. 684 (marked by Boeckeler *C. longus*) to *C. rotundus*.

A species much confounded with the preceding is *C. esculentus*, Linn. (fig. 15); the stolons are very slender, herbaceous, not wiry. In this species (and in many others, as *C. procerus*) they appear to burst from the base of a flowering culm; whereas in *C. longus*, *C. Haspan*, &c. the rhizome creeps and the flowering culms spring from a subterminal bud on it. But both these modes of growth may be seen in the same plant of *C. articulatus*, *C. scariosus* (fig. 22), and others. *C. esculentus* and many other species produce tubers on the rhizomes.

Another plant much confounded with *C. rotundus* is *C. jeminicus* (fig. 17, 18), which is very easily separable by the rhizome, the base of each culm being enclosed in black horny prominent lanceolate cuspidate scales. Fig. 18 shows one culm in flower, the next not started from the circle of black scales; while fig. 17 shows the same with the black scales rubbed off from the base of the culm, a common state in herbaria, as the scales are ultimately caducous; and if a herbarium specimen shows no young circle of black scales, it is usually marked *C. rotundus*. *C. usitatus*, Burchell, is very near *C. jeminicus*; but in it the rhizome is wiry elongate, so that the thickened "bulb" is usually 1–4 centim. distant from the base of the flowering culm.

It must not be inferred, however, that the characters of the rhizome are generally useful in this genus for separating closely allied species; the contrary is the case, *e. g.* in *C. umbellatus* and its numerous subspecies and allied species the rhizome is nearly the same; while in the long series of forms included by Boeckeler under *C. polystachyus* he says the root is fibrous, or there is a short rhizome, or the rhizome is elongate, woody; it is, I believe, always perennial. Again, in the series of plants allied to *C. elegans*, Linn., the rhizome is generally much the same.

This leads us to the question how far we can utilize the rhizome for characterizing groups higher than species; and the answer is, as so often in botany, Sometimes we can, sometimes we cannot. In *C. conglomeratus* and its allies the main roots are densely clothed on all sides with rootlets so as to appear thick and woolly; the character of roots (thick, woolly) defines a very natural group, to which belongs *C. proteinolepis*, Steud., removed by Boeckeler to another group. The forms of the *C. conglomeratus* group of Boeckeler are indeed so closely allied that Boissier (probably rightly) unites, under the old *C. conglomeratus*, several of them admitted as species by Boeckeler.

The species of the group Corymbosi of Boeckeler (*C. rotundus*, *C. longus*, &c.) are connected naturally by the stolons or creeping rhizomes. *C. tenuiculmis*, Boeck. (=*C. lucidulus*, Klein), should be placed next *C. compressus*; and *C. sphacelatus*, because of its fibrous root, I think should not be arranged here, nor the American *C. lætus*, *C. dissolutus*.

The whole of the Exaltati (in which I include the Papyri) are without stolons: the stout culms are generally solitary; but as the culm dies down after flowering there often appear lateral suberect shoots from close to the base; such shoots also occur in several stoloniferous species, and in some with creeping rhizomes. They *may* occur, accidentally probably, in nearly every species of the genus; and though they are generally easily distinguished from stolons, in *C. procerus* there is a very gradual transition from one to the other.

The rhizome is thus a character to which we must pay a very great degree of attention in some parts of the genus, and little in others, whether for specific or subsectional sorting.

The roots of the same species become manifestly thicker, more spongy, when the specimen grows in a very wet place. The species that grow in damp woods, like *C. elegans*, have usually very slender tough black roots; while the species that actually float in tanks (*C. cephalotes*, *C. platystylis*) have very thick roots. The woolly-rooted species are confined to Arabia and the neighbouring desert countries, and assist probably in collecting water, or perhaps give a better hold on the sand.

(2) THE CULM.

The culm is erect, never branched until the umbel, and 0–1 metre (a very few species attaining 1–2 metres) high. It is naked except for $\frac{1}{10}$–$\frac{1}{4}$ its length near the base, where it is sheathed by the bases of the leaves; in a few species, especially in *C. Mundtii* and *C. distichophyllus*, the culm is enveloped half its length by the leaf-sheaths, as also sometimes in *C. Eragrostis*. Great variation in the length of the culm (accompanied by variation in the development of the umbel) occurs in many species, and depauperated examples are common. *C. Eragrostis*, Vahl, as collected by Schrenk at Lake Alakul (called *C. flavescens*, *β. rubromarginatus*, Schrenk) is only 2–3 centim. high, each culm bearing 1–3 spikelets only: a stunted (not depauperated) form of *C. compressus* is not uncommon in which the culms are 1 centim., the umbel contracted but of numerous large spikelets. *C. latispicatus*, Boeck., is very variable in this respect; and I have collected (in Khasia) a form of this absolutely culmless, the well-developed umbel being exactly radical. The culm is generally much longer than the umbel-rays; but *C. radians*, Nees et Meyer, and *C. Griffithii*, Steudel, are at once distinguished by having the umbel-rays 2–3 (or more) times as long as the culm.

The stoutness of the culm ranges from 1–2 centim. down to 1–2 millim. in diam.; yet it is a much more useful character than the length, each species varying in this respect between evident (though troublesome-to-define) limits. Indeed the stoutness of the culm is one of the main characteristics, both with Kunth and with Boeckeler, for forming natural subsections of the species. The group Exaltati (including Papyri) is eminently natural, as also the slender-culmed Aristati. The stout character of the culm is maintained in very short-culmed examples of Exaltati, and the slender character of the culm in very long-culmed examples of Aristati.

The culm is trigonous; but in some species this character is modified until the culm appears perfectly terete; in others it is intensified, and we have a triquetrous stem. The culm is commonly nearly round below, becoming trigonous upwards, most sharply so under the umbel. The culm is frequently more or less unequally trigonous, and sometimes excessively so, until it is described as complanate, as occurs in *C. Haspan* (type) and *C. malaccensis.* In *C. articulatus* (and *C. nodosus,* scarcely specifically distinct) the culm is terete, quite smooth, continuous when fresh; but after a day or two in drying-paper the pith thickens at regular intervals, giving the culms a falsely articulated appearance. This character, not uncommon in *Eleocharis* and *Scirpus,* is not distinctly brought out in any other species of *Cyperus.*

The degree of sharpness of the angles of the culm is marked in certain species, as in *C. turgidulus,* in which the culm is 3-winged, and is in specific descriptions usually treated as an important point, but I fear can only be relied on as a subsidiary character. *C. tegetiformis,* Roxb. (*C. enodis,* Boeck.), has been separated from *C. corymbosus,* Rottb. (*C. diphyllus,* Retz.), by the more acutely-angled culm (especially close under the umbel); but I doubt whether the two forms can be separated by that or by any other character. Many species (both among those with slender and those with moderately thick culms) have the faces between the three angles striate; and these striations in some species are strengthened so as to obscure the angles, until we finally get a terete, striated, or fluted culm. Such culms are often accompanied by rigid leaves (with inrolled margins), and are characteristic of dry-country species, as the Conglomerati of Arabia and many species of the Great Thirst-Land in South Africa.

The culms in *Cyperus* are generally smooth, or only microscopically scabrous on the angles near the top. In *C. platyphyllus,* Roem. et Sch., a very large species, the angles of the culm are serrulate, cutting the hand.

The species of *Cyperus* are in general quite glabrous; in a few species there is a pubescence on the rhachis of the spikelets, and in a very few species there are very slender hairs on the leaves. The pubescence only extends to the culm in the following:—in *C. viscosus* (and one or two allied species) the culm is puberulous, or with microscopic papillæ giving it almost a sticky character; in *C. retrofractus,* Asa Gray, the culm is manifestly pilose.

(3) The Leaves.

The uppermost leaf is generally narrow-linear, with a midrib, often scabrous on the margins towards the tip with forward-pointing serrulations; with many longitudinal nerves, certain of which are in some species especially prominent; flat, green, in the moist-country species; straw-coloured, rigid, inrolled in the dry-country species; the lower leaves are by degrees shorter, becoming lanceolate or even triangular, the sheath often shortened also, until the lowest leaf may be a nearly free ovate-lanceolate scale, hardly different from the scales on the stolons.

The length of the leaves is an obvious character, dear to systematists, and employed by Boeckeler even as a subsectional character; but in my opinion it is hardly characteristic in any one species, and it should be employed cautiously as a subsidiary character only.

Beginning with *C. Haspan*, in typical forms the leaves are very short, often reduced to mere short-lanceolate appendages of the sheaths; but there are other forms with the leaves more developed, and in very numerous examples they are longer than the culm. (This is true even after every example possible has been separated off into *C. flavidus*, Retz.)

In *C. latispicatus*, Boeck., the uppermost leaf is often as long as the culm, but generally most of the lower leaves are reduced to sheaths; *C. aphyllus*, Boeck., is the same thing, *all* the leaves being reduced.

Boeckeler places *C. enodis*, Boeck., *C. diphyllus*, Retz., and *C. corymbosus*, Rottb., in a sect. Subaphylli, from which the Foliati beginning with *C. Schimperianus*, Steud., are separate. The fact is that in *C. corymbosus*, Rottb., the leaves vary from 0 to the length of the culm; and that the greater portion of the Indian material sorted under *C. corymbosus*, Rottb. (on the character of length of leaves), by Boeckeler is *C. tegetum*, Roxb., a species from which *C. Schimperianus*, Steud., cannot be separated. (I state this broadly, as *C. tegetum* is separable from *C. corymbosus* definitely by the structure of the spikelets.) In *C. tegetum* also the leaves may be as long as the culm or subobsolete, and in the nearly allied *C. scariosus*, R. Br., the variation is nearly as great. After collecting *C. tegetum* and *C. corymbosus* with my own hands for years, I am of opinion that the leaves are nearly or quite valueless in sorting these and their allies. *C. diphyllus*, Retz.

is as near as may be typical *C. corymbosus*, Rottb.; the longer-leaved forms of this (added to much of *C. tegetum*) make up *C. corymbosus*, Boeck.; short-leaved forms are doubtfully distinct specifically from *C. tegetiformis*, Roxb. (*C. enodis*, Boeck.), in which the culm (dried) is often obscurely septate.

In *C. articulatus* itself the leaves very generally are subobsolete, but accidentally I have seen leaves 1–2 decim. long even in this species.

The roughness of the leaf-margins is a character of very small value: most species exhibit it to some extent; and in the same species the roughness may be evident in some leaves, obscure in other less developed-leaves. The roughness also extends in many species to the upper part of the midrib beneath. The midrib is very prominent in some species, so much so as to be described by Boeckeler as "winged" in *C. lucidus*, R. Br.

As in the case of the culms, the breadth and stoutness or texture of the leaves is a much more constant character, both in species and in subsections, than their length. The rigid, thick, incurved, straw-coloured leaves of the Conglomerati have been mentioned. In the group of Elegantes the leaves are unusually broad, flat, green, prominently many-nerved. In the whole section *Mariscus* the numerous grass-like leaves are similar. In the Exaltati the leaves are stout, with mostly compressed sheaths; and in *C. platyphyllus* attain 2–3 centim. in breadth. In several species, from various groups, the leaves are of coarser looser tissue than usual; so that when dried they appear full of transverse small septa. This is a very constant and convenient character in particular species, as *C. dilutus*, Vahl, *C. canescens*, Vahl, *C. virens*, Asa Gray, *C. Lechleri*, Steud.; more obscure in *C. procerus*, Rottb., and many others.

The leaves are very generally glabrous; but hairy or puberulous in the species mentioned above as having hairy or puberulous culms. Also in *C. strigosus*, and a few other American species, the leaves are strigose upwards, with such very fine hairs, however, that they are hardly noticeable until searched for.

(4) THE BRACTS.

The bracts to the umbel are the cauline leaves of the plant, and are always similar to the radical leaves. This is not true merely of species, but of individuals: in a leafless specimen of *C. Haspan* or *C. corymbosus* the bracts will be short, much shorter than the umbel; but in leafy examples of *C. Haspan* or *C. corymbosus* the bracts will be long, far overtopping the umbel. The most nearly leafless species in the whole genus is *C. articulatus*; and in this the bracts are 1–2 centim. long only. In breadth, scabrousness (or pubescence), nervation, and texture the bracts invariably resemble the leaves; in many cases therefore, where a critical species as *C. Haspan* is propped up by characters taken from the bracts, there is no real combination of characters, and the delimitation of the species is not materially strengthened. In *C. vaginatus*, R. Br., of which I have seen very little material, the leaves are reduced to short ovate acute terminations of the sheaths, the bracts are 2–3 centim. long, linear, rigid: this may be a partial exception to the rule above laid down; but I should expect among a large quantity of *C. vaginatus* to find examples with the leaves developed to 3–6 centim. long, and in such case I feel confident they would closely resemble the bracts.

The bracts are in most species apparently umbelled, but they are always really alternate; and in many species they are manifestly alternate, so that the umbel is said to be imperfect or corymbose: Linnæus named *C. alternifolius* from this character. *C. jeminicus* (when the rhizome is wanting) can be separated from *C. rotundus* (to which I find *C. jeminicus* without rhizome very generally referred in herbaria) by the lowest bract being clearly remote (2–3 millim., sometimes by 1 centim.) from the one next above it—a trifling, but so far as seen invariable, mark.

The bracts are usually divaricate or erect-patent; but in several species the lowest bract is nearly erect, sometimes quite so, so as to appear a continuation of the culm, and the umbel appears lateral, as in *C. lævigatus*, *C. stramineus*, *C. pauper*, and in several of the Conglomerati. The character is useful in recognizing some of these species rapidly; but it is of small value, for, of many species with spreading bracts, in smaller specimens with 2 or 3 bracts the lowest bract becomes nearly erect, as in *C. flavescens* depauperated. From the axil of each bract springs a ray: the number of rays is thus never less than the number of bracts; it is in general more, because, from the shortening of the uppermost nodes of the axis, the bracts are suppressed though the rays belonging to them are developed. This law can be supposed true, however, only theoretically in the case of congested or capitate umbels, which often appear as simple heads with numerous bracts.

The bracts are usually 3–6 in number, occasionally 3–10. In *C. æqualis* and *C. Papyrus*, where the number of rays may reach 100, the number of bracts is not increased at all in proportion.

(5) The Umbel.

In *Cyperus* the inflorescence is always an umbel, *i. e.*, as we have seen, a congested corymb, which may be reduced to a dense capitulum, or may be compound or supradecompound; in the compound umbels the umbellules are similar to the main umbel, but often less congested, till in many species they lose the umbellate appearance altogether, and can only be described as open corymbs, often with patent or divaricate branches.

The corymb is always very much depressed, so that the nodes between its upper branches are obsolete, while the branches themselves gradually increase in length from the uppermost, which is 0, to the lowest, which may be 0–3 decim. The main umbel thus has more or less unequal branches with a sessile spike in its centre, and the secondary, tertiary, &c. umbels take the same form which gives *Cyperus* its distinctive appearance. Perhaps the most aberrant species in the genus in habit are thus *C. Papyrus* and *C. æqualis*, in which we have a great number (up to 100) primary rays (instead of the usual 3–10), and these all very nearly equal in length; and in these two species the central sessile spike is depauperate amid the crowded bases of the rays or altogether suppressed. But throughout the genus the structure of the umbel is most essentially and minutely the same; and great differences in its aspect are caused by mere variations in the length (and angle of divergence) of the primary, secondary, &c. rays. This identity of real character has always been a source of difficulty in the verbal definition of species and subsections of *Cyperus*, in which all authors are agreed in regarding the umbel as a character of great weight.

The development of the umbel varies enormously in nearly all the compound species; *i. e.* those species which, when fully developed, have a compound or decompound umbel, produce in numerous examples only a simple or small umbel. Thus *C. rotundus*, Linn., has ordinarily a compound (often lax) umbel with very numerous spikelets; but small examples often have a simple umbel or even a single spike; and a form which I have called form "*Salsola*" is common near the sea (as at Calcutta), in which each culm produces 1–5 spikelets only. The number of spikelets on one culm of *C. platystylis* varies from 1300 down to 5 in the series of examples in the Calcutta herbarium. In *C. pilosus* the umbel varies from a capitulum 3 centim. in diameter up to a long-rayed umbel 3 decim. in diameter, and the spikes themselves vary so greatly in density that numerous species have been founded thereon. The degree of development of the umbel would therefore be a character of little value, but that there is a great number of species in which the umbel is apparently simple, and never (or most rarely) in these varies so as to be clearly compound. Yet in the species best defined as to their umbels variation occurs, so that both Kunth and Boeckeler avoid as much as possible "umbel simple," "umbel compound;" though as a description of the general appearance and average character of the inflorescence such terms are short and convenient. Thus in *C. pumilus*, Linn. (i. e. *C. nitens*, Vahl) the umbel has nearly always the definite appearance of being simple, with rays carrying heads at their extremities (or, as in all such inflorescence, the umbel may be reduced to a capitulum). In numerous examples the simplicity of the umbel appears absolute; but in those having heads of numerous spikelets it is easily seen that these heads are not simple spikes, but have their axis divided. In very fine specimens a green bract 1 centim. long will sometimes be found under the heads; the presence of such a bract (homologous with the main bracts of the umbel) is here (as I believe in all species) a sure indication that the apparent head is really an umbel. In a specimen I have now before me, *C. pumilus* has distinctly a compound umbel, the secondary rays attaining 15 millim. in length.

In this genus the distinction in the number of subdivisions of the axis before we come to the flower, a distinction held of such high value by Eichler &c. in *Kobresia* and *Carex*, is, from the nature of the inflorescence, utterly illusory. In *C. polystachyus*, var. *ferruginea* (fig. 27), the umbellule is laxly corymbose, the lower branches manifest, bearing 4–2–1 spikelets; and from the picture it is evident that the upper solitary spikelets may or may not at some arbitrary point be considered as spikes of one spikelet. Other primary rays on this same plant carry apparently simple spikes which are clearly homologous, being = fig. 27 with the two lower branches suppressed. These are treated as simple spikes in ordinary descriptions; and indeed in ordinary descriptions arrangements like that in fig. 27 are described as "rays with 3 spikes, terminal spike elongate, lateral short or auriculate:" this is a frequent occurrence in *Cyperus*, typical in *C. Luzulæ*, *C. lucidus*, and many others, and occurring occasionally in *C. umbellatus*, Benth., and other species where it is not admitted by the book description. It is so characteristic of the very nature of *Cyperus* inflorescence, that I should not be surprised at its occurrence anywhere.

C. polystachyus is a well-known species excellently adapted for a discussion of the inflorescence of *Cyperus*. In even moderately-well developed examples I find the umbel invariably compound; the umbellules are often congested into dense heads, but their axis is then evidently divided. In the vulgar form of *C. polystachyus*, common near the sea in nearly all the continents and islands of the tropical world, the umbel is usually (as in *C. rotundus* and some other species when near the sea) greatly contracted; and this form, the commonest in collections, has been treated as *C. polystachyus* type; while a multitude of "species" have been created by herbarium botanists out of the inland forms with more or less open umbel. In nearly every example, whether with open or close umbel, the smaller few-flowered umbellules may appear perfectly simple spikes until they are compared with all the other spikes on the same plant.

But in *C. filicinus*, Vahl (= *C. Nuttallii*, Eddy), esteemed, not without reason, a var. of *C. polystachyus* by Boeckeler, every spike in every specimen I have is in appearance perfectly simple; fig. 26 exhibits one of the largest. The spikelets themselves are here considerably larger than in ordinary *C. polystachyus*; but it occurs in many species with various umbels that, besides the standard form, there occurs another with the umbel divided one time less, and the spikelets considerably larger.

In this fig. 27 I have shown the two lowest glumes of the spikelet A and B, alternate, smaller than those above them, and both (or sometimes one only) empty; the lowest empty glume (A) is (in other species) sometimes truncate, sometimes with a long caudate point bracteiform: this is a useful character in specific discrimination. In other species too, as a first indication that the spike is beginning to become compound, there is a green caudate small bract close below A and on the same side of the spikelet (it is therefore I call it a bract, and not a glume). This is (at least I hope I have, after much labour in distinguishing the bract from the glume, come to that view) a point of little or no value in defining species. The spikes (as explained above under *C. pumilus*, and as shown by the discussion of fig. 27) pass so insensibly, in the same species and in the same plant, from simple to compound, that the presence of this bract is even in species like *C. inundatus*, Roxb., where it has been fixed on as an important character, highly uncertain.

The characters of the spike itself are of high differential importance, and also in high degree constitute the features of the whole umbel. We have first the spikes of few spikelets, as in *C. elegans*, the spikelets strictly digitate. In some of this set (as *C. diffusus*, Willd., *C. multistriatus*, Boeck.) we have "pedicelled spikelets," which I consider, however, always as spikelets sessile in spikes of one spikelet. From this we have "stellate spikes;" and so by degrees the rhachis more elongate, until we have cylindric spikes with a rhachis 1–5 centim. long: in these the spikelets may be densely crowded or distant, but many species (as *C. exaltatus*) are very variable in this respect. When the spikes are long, bowing with subremote spikelets, they are often described as racemose, which view is somewhat supported sometimes by the remote empty (or deciduous) lower glumes; but I think in all these cases the spikelets should be considered sessile and the ultimate divisions of the inflorescence "spikes."

While the inflorescence is thus flexible in character, it must remain a chief character in all species; but exactly the same kind of inflorescence meets us in various (and remote) sections of the genus, so that reliance on external general character of the inflorescence, without also examination of the nut and stigmas, has led botanists into numerous errors for the last century. *C. cephalotes*, *C. pygmæus*, and *C. dubius* all have a single capitulum, the leaves and bracts much alike; they were variously confounded, then mixed, then reseparated under new names by Roxburgh, Wallich, and others. Boeckeler has united with *C. pygmæus* also *Isolepis Micheliana*, Roem. et Sch., which I agree with Kunth (as attempted to be proved below) to be of a different genus. *C. procerus* and *C. puncticulatus*, than which no two species are more essentially distinct, are confounded in the description of Roxburgh and in the collections of Wallich, and the confusion has (by the issue of specimens correctly matched from Kew) been widely disseminated. Roxburgh, after figuring *C. amœnus*, Heyne MS., guessed, on comparing Rottboell's figure of *C. alopecuroides*, that (from the similarity in umbel) it must represent the same plant, despite the fact that Rottboell gives a totally different nut. The error has been continued to Boeckeler, though it is possible that Boeckeler has never seen the true *C. alopecuroides*, Rottb., and that he has only seen *C. alopecuroides*, Roxb., and allowed it occasionally to have a dorsally compressed nut, in order to include Rottboell's. However that may be, Boeckeler's *C. alopecuroides* is (as he says) very nearly the same as *C. dives*, Delile; and both may, I think, be best considered mere varieties of *C. exaltatus*, Retz., while *C. alopecuroides*, Rottb., is very closely allied to *C. Monti*. A more difficult case is the union of *C. inundatus*, Roxb., with *C. procerus*, Rottb., which I also believe an error, founded on trusting too absolutely the general aspect of the umbel.

The character of the umbel is put forward prominently, both by Kunth and Boeckeler, in grouping the numerous species of the subgenus *Eucyperus* into sections: a matter so difficult that we may fairly catch at any straw that can possibly aid us. Some groups, as the Exaltati (including therein the Papyri), are allied by an indefinable similarity of umbel. But the character of the umbel, even in hands of the experience of Boeckeler, will not always enable us to place a species next to its neighbour. Boeckeler places *C. jeminicus*, Rottb. (= *C. tuberosus*, Vahl), among the Corymbosi, whereas I take the plant to be very near to (specifically distinct from) *C. usitatus*, Burchell, which Boeckeler has in a very different place. *C. tenuiculmis*, Boeck. = *C. Zollingeri*, Steud. = *C. lucidulus*, Klein, is placed also by Boeckeler among the Corymbosi, but has been rightly placed both by J. D. Hooker and Hance (under other names) close to *C. compressus*. Many of Boeckeler's sections include great variety of inflorescence; and my argument is, not that I am prepared to propose a much better grouping than his, but that the value of the umbel as a character in forming groups must be regarded as doubtful until backed up, and as unequal in different parts of the genus.

In the type section of the subgenus *Mariscus* the character of the inflorescence appears more constant, even in variable and composite species. In *C. umbellatus*, Benth., there is one (apparently) spike on each primary ray. This character is constant through an enormous range of subspecies, though occasionally I have seen one or two smaller spikes added on one ray. One spike on each ray seems also the invariable rule in *C. retrofractus*, *C. ovularis*, Torrey, *C. flavus*, and the whole of this series; while in the series *C. Andersonii*, *C. Seemannianus*, &c., digitate spikes on each ray appear equally constant; but of these species I have seen few examples; of *C. umbellatus*, Benth., thousands (in a literal sense).

The rays and radioles of the umbel are terete, triangular, or compressed, much as the culms; very generally glabrous, but hairy in the few species with hairy culms. The rhachis of the spikes is generally angular, deeply grooved, and occasionally minutely scabrous. In *C. pilosus* the scabrousness of the angles of the rhachis of the spikes becomes "pilose;" *i. e.* the rough points come very close together, and take the form of very short brownish hairs. This distinguishes the species from all others readily except from *C. procerus*, in which the rhachis of the spikes is sometimes glabrous, usually scabrous, sometimes "pilose," or at least undistinguishable from that of *C. pilosus*.

(6) THE RHACHILLA OF THE SPIKELET.

The examination of the rhachilla, especially after some of the lower glumes have fallen off, is a convenient way of observing the structure of the spikelet. A glance at the rhachilla of *Isolepis Micheliana* will show how far the plant must be removed from *Cyperus*, in which the notches are on two opposite sides of the compressed (or subquadrate) rhachilla; and a similar glance will show *Cyperus Ranko*, Steudel, to be an *Isolepis*. The great variety in the rhachilla is seen by comparing a few common species, as *C. puncticulatus*, Vahl (fig. 30), *C. Monti*, Linn. (fig. 29), *C. lucidulus*, Klein (fig. 28), *C. auricomus*, Sieber (fig. 31), *C. flexuosus*, Vahl, *C. umbellatus*, Benth.; and the differences are not merely manifest, but constant; and are treated as of importance, for species and for groups, by Kunth and Boeckeler. The bases of the glumes are decurrent on the rhachilla, forming two lines of "wings" to it on either face. These wings are in some species (as in many of the subgenus *Pycreus*) obsolete; in others, as in *C. compressus*, they unite to form narrow continuous scarious wings running down the whole length of the spikelet; and such wings are in many species broader, sometimes purple-spotted. In other species the wing is not continuous (at least not in subequal breadth); frequently the base, sometimes nearly the whole, of the nut, lodged in the notch of the rhachilla, is held on each side by the widened wing of the rhachilla. In most species the wing separates off from the base of the glume, long before the nut is ripe, by a transverse line; and in a limited number of species the wing, at nearly the same early period, separates from the rhachilla on which it is decurrent, and thus drops off freely: *i. e.*, in the words of cyperologists, the wing is soluble, not persistent. The soluble wing is often discoloured, yellow or reddish, and thus prominent, and is the character which separates the Papyri of Kunth and Boeckeler from the Exaltati. In the Exaltati, however, I find sometimes a very small linear (but discoloured unmistakable) soluble wing. Also in *C. tegetum*, and some neighbouring species, the solubility of the wing appears to vary greatly in the same species, and the wing differs altogether in degree and character in species placed close together by authors. The solubility of the wing of the rhachilla is a useful character, but one concerning which I can draw no hard-and-fast line; it connects the Papyri, a series of species naturally connected by many other characters; it only throws doubt on the next group, the Corymbosi, as to whether they have been rightly placed together.

The form of the rhachilla (much compressed or quadrangular) is not of sectional value, *i. e.* a subquadrangular rhachilla occurs in species from various sections of the genus, as in *C. globosus*, *C. Monti*, &c.; but it is very useful in separating some jumbled species, *e. g.* the quadrangular rhachilla of *C. alopecuroides*, Rottb., distinguishes it from *C. alopecuroides* of Roxb. and Boeckeler, and the shape and markings of the notches in *C. alopecuroides*, Rottb., support its otherwise evident affinity to *C. Monti*. The shape of the notches of the rhachilla, which vary from quadrangular (or even broader than long) up to narrow-oblong and linear-obovate, is a character rarely used, for it is (in the main) involved in the character "glumes crowded" or "glumes remote;" but, in the case of critical species, it may be well used, not as a mere repetition, but as capable of much greater definiteness and of more additional detail than the ordinary "glumes subremote."

The later groups of *Cyperus*—viz. Leptostachyi, *Mariscus*, *Diclidium*—differ from all the rest, not so much in the number of the flowers or the persistence of the wing of the rhachilla, as in the persistence of the *glumes*, which do not fall off by a clean disarticulation from their decurrent bases. In the Leptostachyi the spikelets fall entire from the papilliform disks on which they are seated *before* the glumes fall from the rhachilla, usually leaving the two lowest barren glumes still attached, or leaving only the papilliform disk bare; while the rhachilla is very narrow. *Mariscus* is nearly the same; but the rhachilla is usually thickened, often almost spongy. In *Diclidium* the spikelets finally break up into one-seeded joints, nearly in the manner of *Rottbœlliæ* among Grasses.

(7) The Glumes.

In *Cyperus* perhaps more attention than is deserved has already been paid to the glumes, more especially to their being mucronate or obtuse, to their colour, and to the greenness of the dorsal nerves.

As to the mucronation, there is no point more illusory, even in the same species and example. The green nerves of the back unite and are just excurrent as a mucro close beneath the apex of the glume, or are not excurrent; and the two cases fade one into the other, as in the common species *C. pumilus*, Linn. (i. e. *C. nitens*, Vahl), of which the varieties called *mutica, patens, truncatula* are without the mucro. The same variety in mucronation occurs in the Conglomerati, and almost throughout the genus; though in particular species, as in *C. rubicundus*, Vahl, the mucronation appears characteristic. Still more untrustworthy is the mucronation as a sectional character: *C. amabilis*, Vahl, one of the most characteristic of the Aristati, is often absolutely devoid of aristation; while *C. lucidulus*, Klein (correctly placed next *C. compressus* by Hooker f., and Hance), has been removed entirely out of its proper place by Boeckeler, apparently solely because its glumes are not acute cuspidate.

The colour of the glumes is an even more dangerous character to lean upon: it still remains as diagnostic in *C. melanostachyus*, *C. atronitens*, &c., and many other species of which (with their allies) we know little; but in the widely-known *C. polystachyus*, *C. globosus*, *C. lævigatus*, &c., colour goes for nothing as a specific character; we have, indeed, the whole range of colour from straw-colour to black in the self-same species. There are indeed few species amply illustrated in our herbaria of which the range of colour is not considerable. Nevertheless, in a broad way, a particular tint characterizes most species. *C. flavescens* is nearly always yellowish; *C. dilutus* is nearly always a reddish brown, &c. The occurrence in *Cyperus* of glumes which are 3–7-nerved, green on the back, yellow, red, purple, &c. on the sides, is so common that the green nerve is hardly worth mention in specific descriptions; and from accidental circumstances the usually green-backed species sometimes have no green tint.

The difference between round-backed and carinate glumes makes the difference between terete and compressed spikelets. In many species there are no nerves except near the keel of the glume. In other species the glumes are plicate-striate throughout nearly their whole breadth. This character is useful, not merely in separating some critical species as *C. esculentus*, but in defining some sections, as the Nivei.

The open cellular texture of the glumes of *C. hyalinus*, Vahl, is strikingly unlike any other species of the genus.

The glumes are generally quite smooth; in a few species the keel upwards is scabrous under a magnifier.

More important points in the glume are the dorsal compression in sect. *Juncellus*, accompanying the dorsally-compressed nut, and its insertion, already considered under the rhachilla.

(8) THE STAMENS.

(a) *Number*. The number of stamens is 3, 2, or 1; in most large species 3, in many small ones (whether the style be bifid or trifid) 2–1. The sect. Luzuloideæ (*C. vegetus*, *C. virens*, *C. Luzulæ*) are almost the only large or medium-sized species in which the stamen is 1 only. In many species the stamens are 2 in well-developed, 1 in poorly-developed specimens, or mainly so.

In *Pycreus* perhaps two thirds of the species have 2 stamens (or 1), but this goes with the size mainly of the species. In the small species of *Eucyperus* (as in sect. Aristati, and in *C. flavidus* and small *C. Haspan*) the stamens are also 2–1; in *Juncellus* the large species (as *C. Monti*, *C. inundatus*) have 3 stamens, the small (as *C. lævigatus*, *C. pannonicus*) 2–1. The number of stamens rarely varies 3 or 2 in one species; so that we have in the number of stamens a character often useful as a specific, sometimes as a subsectional distinction.

(b) *Filaments*. These are always more or less ligulate; they are exceedingly broad, somewhat widened upwards in the Conglomerati and in *C. cephalotes* and *C. platystylis*. They are usually distinctly ligulate, and only obscurely so in the small-flowered species with small stamens.

The length of the filaments and exsertion of the anthers are sometimes described; but there is much uncertainty in the value of the character, and the filaments (apparently from an obscure tendency to unisexuality) sometimes remain short in nearly all the flowers of a spikelet or of a plant, so that errors may easily arise here.

The tissue of the filaments is of lax oblong cells, and in many species (as *C. globosus*) this is so lax as to give a scabrous-papillose character. The filaments look here rough to the naked eye, but there is hardly a species in which the microscope will not reveal a structure essentially the same.

The persistency of the filaments is very characteristic of some species (as of *C. globosus*), where they remain attached, without anthers, after the glumes have fallen.

The anthers themselves are always normal, oblong or linear-oblong, yellow, red, or white, with purple spots.

The anthers are in the majority of species simple, muticous, or with a minute apiculus at the apex; but in many species the anther has a lanceolate scarlet crest, very constant in size for each species; in some minute and not always to be made out, in others prominent, in *C. platyphyllus* (fig. 32) two thirds the length of the anther. In *C. lævigatus* (fig. 33) the crest is much smaller; in *C. platystylis* (fig. 7) and several others it is small, truncate; in *C. Haspan* (fig. 34) the crest is obsolete, only a few of its linear acute papillæ sometimes developing.

The anther-crest is wanting in a majority of species; but where present it is, from its constancy, a very valuable character in the separation of species. In *C. inundatus*, Roxb., there is a depressed rudimentary crest exactly as in the closely-allied *C. Monti*. In *C. procerus*, Rottb., on the contrary, the anther is absolutely ecristate and similar to that of the allied *C. pilosus*.

The crest of the anther also has a subsectional, but no sectional or subgeneric value. A small hispid crest is characteristic of the whole group Elegantes. *C. elatus*, Linn., is by its anther-crest closely joined to *C. platyphyllus*, and *C. pannonicus* to *C. lævigatus*. There is no clearly cristate anther in any species of the subgenera *Pycreus*, *Mariscus cum Leptostachyo*, *Diclidium*. Nevertheless the species with a highly-developed crest are scattered in *Juncellus* and in remote sections of *Eucyperus*, so that the character cannot be used as a primary one in the delimitation of the larger divisions.

(9) THE STYLE.

The style is trifid or bifid, or in one species, *C. cephalotes*, subentire. The style is in each species, section, and subgenus of

Cyperus either 3-fid or 2-fid, without exception; and therefore the primary subgenera of *Cyperus* have always been founded on this character. This was the view of Kunth. Regarding the character as absolute, Nees, Reichenbach, and others have elevated *Pycreus* to generic rank. But Boeckeler has blown upon the character a little by uniting certain species into composite species, each of which may have either a 3-fid style with triangular nut, or 2-fid style with complanate nut. These species are *C. alopecuroides*, Rottb., cum *C. dives*, Delile; *C. inundatus*, Roxb., cum *C. procero*, Rottb.; *C. pygmæus*, Linn., cum *Isolepide Michelianâ*, Roem. et Sch. In each of these cases I consider two remote species have, from general aspect, been mixed, and that the more carefully they are examined, the more essentially and structurally they are found to be distinct. This I have attempted to explain fully below.

In *C. stoloniferus*, Retz., Boeckeler says, "stylo elongato (quandoque abbreviato) profunde bi- v. trifido aut indiviso." I find the style always deeply trifid. To examine the style, a flower should be dissected just before expansion (this gives you the stamens by the same dissection); it is dangerous to trust to older flowers, as the brittle style-branches often break off exactly at their point of separation, in which case, even with the microscope, it is difficult to see the scar. The casual cases of suppression of a style-branch that occur are excessively few, I should say in my experience not 1 in 1000 for the genus. The stamens (ecristate &c.) are certain proof that Boeckeler is in error in placing this species with *C. lævigatus* &c. It is not far from *C. rotundus*, but perhaps nearer *C. arenarius*. In nearly all the critical species it is less trouble to examine the nut than the style (*i.e.* in mere sorting and naming). The nuts of *C. alopecuroides*, Rottb., and *C. dives*, Delile, are as unlike (not merely by two rounded or three sharp angles) as any two in the genus.

The style-branches are usually long-linear, shortly or distinctly exserted from the glume, but sometimes very much exserted, so that the spicula are said to be comose. This character is the only point left to keep *C. diandrus* distinct from *C. rivularis*; and some (even of the American botanists) do not think the two distinct. There is a strongly comose *Cyperus*, resembling *C. Monti* in all other points but this, among Griffith's collections; and there is a fragment, collected by V. Ball in Chota Nagpore, which does not differ much from *C. pilosus* except in being comose. I do not like to propose new specific names and give long descriptions of these, when I see the considerable variation in length of style which occurs in many fully-known species.

The style-branches are unusually short and broad, much papillose-flocculose (reminding of *Fimbristylis*) in the happily-named *C. platystylis*, R. Br.; and the style is something similar in *C. ægyptiacus*.

(10) THE NUT.

The form, size, and surface-appearance of the nut are characters of primary importance.

The first distinction in form is between the trigonous and flattened nut, according as the style is trifid or bifid. The character from the style has been generally preferred, being more definite; for in *Eucyperus* the face of the nut is frequently flattened against the rhachilla, whilst the nut is unequally trigonous, the dorsal angle being but slightly developed; and in *Juncellus* the nut is often convex on the back, so that the distinction founded on the nut, though clearly enough visible in most cases, fades away in some instances.

C. stoloniferus, Retz., is placed by Boeckeler in *Juncellus*; but the nut is not less trigonous than it is in *C. arenarius*, *C. Aucheri*, and others of the Conglomerati, which he places in *Eucyperus*. (The var. β and γ in Boeckeler do not (mihi) belong.) I think the species altogether a *Eucyperus*.

C. pygmæus, Rottb., contra, is placed by Boeckeler in *Eucyperus*, as having a "triangular" nut: this I do not find so at all (fig. 10). I agree with Kunth and Bentham that the species is a *Juncellus*.

In the cases of *C. alopecuroides*, Rottb., and *C. inundatus*, Roxb. (which I have considered separately below), the form of the nut is definite in each species (or var., as Boeckeler considers).

The flattened nut may have an edge (*Pycreus*) or a face (*Juncellus*) next the rhachilla; and this distinction is very strong. *Juncellus* is much more clearly separate from *Pycreus* than from *Eucyperus*.

The shape of the nut, as narrow-oblong, broad-obovoid, truncate, shortly rostrate, &c., affords an excellent specific character, constant (speaking in a broad way) in every species.

In most of the really natural sections a similarity of nut is found. In the *C. auricomus* group the nut is peculiarly umbonate; in the Elegantes group the nut is ellipsoid, acute at both ends sharply trigonous, somewhat large; in the Conglomerati (and some of the allied Arenarii) the nut is unequal, dorsally compressed. So much is this the case that, where great differences in the nut are found in one of our groups, it may be suspected we have not discovered the true affinity.

The nut is smooth throughout the genus; an imperfect tuberculation occurs in *C. Haspan* (and a few others), but only casually in some specimens, not throughout the species. The colour of the nut is a good character, but the nut is in a great majority dark; and care of course must be taken not to describe colour from unripe or imperfect nuts, which abound in some species (as *C. pygmæus*).

The size of the nut is measured in comparison with the length of the glume; it is said, therefore, to be "very large" in *C. difformis* (where it is nearly as long as the glume), though, speaking absolutely, it is small. The nut in *C. Haspan* is very small, in *C. Iria* large; and these species, from Linnæus downwards, are nevertheless mixed in herbaria.

I find, however, a considerable range of size (not of form) in the nuts of many species. The plant which I call *C. exaltatus*, Retz., var. *Oatesii*, is very likely distinguishable as a species; but as I have been able to hit on no tangible character except the *size* of the nut (to separate it from *C. exaltatus*) I leave it as a variety.

In *Cyperus*, as in some other genera of Cyperaceæ, botanists have exhausted their vocabulary in describing the surface of the nut as shining, reticulate, velate, puncticulate, transversely marked, &c. &c., according to the general appearance it presents under a pocket lens, without (as I conceive) getting clear hold of some important differences of structure met with.

The outermost layer of cells of the nut in *Cyperus* is without colour, usually hyaline, sometimes opaque, white, permanent or flaking off (detergibiles), not very thick or lax (as often in *Isolepis*), and either subquadrate (figs. 31–39) or oblong longitudinally (fig. 40) (2 or 3 times as long as broad). There appears nothing intermediate between these two cases. The only longitudinal-celled species of *Cyperus* are about a dozen, all in *Pycreus*, and forming a natural group, of which *C. flavescens* is a well-known example. This character is so absolute that I am able to say with much confidence that the Australian fragment (on which Mr. Bentham doubtfully extended *C. flavescens* to Australia) is not *C. flavescens*, and that *C. flavescens* has not yet been collected east of Cabul. Its area, corrected by this character, becomes very natural; for the South-American *C. Olfersianus* (with its allies or subspecies from Mexico and the Andes) has the outermost layer of cells of the nut subquadrate, and separates off cleanly.

These species are usually described (Boeckeler &c.) as having the nut "transversely striate" or "transversely undulate-rugose." The outer cells are in this group hyaline, and more prominent at the narrow ends of the cells, in many cases actually wearing away from the middle of the cells; hence the nut, under a pocket lens, takes the aspect in fig. 41. The "transverse striation" is, however, a very deceptive character, being prominent in some nuts, utterly obscure in others from the same plant (all characters derived from degree of flaking-off are untrustworthy throughout the Order, as I attempted to show for *Carex* in my 'List of Andover Plants' 17 years ago). The character derived from the oblong (not quadrate) cells is absolute.

In the quadrate cells there are minute differences, which are mostly very constant for the same species, and even for the same variety. In many of the smaller nuts the outermost layer of cells is thin, hyaline, not detergible; consequently it cannot be detected without a microscope and a dark field. The nut is usually described by cyperologists in this case as *lucida*.

Sometimes the outer cells are opaque, white, permanent, as fig. 35. Such a nut is seen in *C. bromoides*, Willd., and is described (by Boeckeler) as "transverse lineato-granulata fusconigra nitidula." In *C. unioloides* and *C. angulatus* the outermost cells of the nut are similar, but nearly always broken at the centre, so that the nut is described as "porose" (fig. 38). I consider (as does Mr. Bentham) *C. bromoides*, *C. unioloides*, and *C. angulatus* one species; but I can nevertheless from one nut only generally tell whether the specimen came from Australia, India, the Cape, or South America.

The outer cells of the nut (rarely) are somewhat inflated, lax, and yet do not break up at the centre. Such nuts are described as scabrous-papillose and by various names. The character occurs sometimes in *C. globosus* (as see fig. 36), but is not universal for that species.

A very common form is the "puncticulate nut;" here most of the outermost cells have a minute microscopic puncture (a very small pore, if you like) at their centre, through which the darker body of the nut is seen (fig. 37), as in *C. pumilus*, var. *punctata*. But a great number of the nuts described as punctate are *not* punctate. In those species in which the outer cells are specially impunctate but slightly inflated, their middle points, being elevated above their margins, reflect the light strongly, and, under a pocket lens, the nut looks covered with rows of white points; these are more particularly the punctate nuts of cyperologists, and they are particularly devoid of punctations; something between fig. 35 and fig. 36 represents them.

Lastly, the outer cells are more detergible, so that only their margins remain (fig. 39). The dark body of the nut is covered with a reticulate white veil; this is the "reticulated nut" properly so called; but this name is applied loosely to any nut of which the quadrate outer cells are to be seen with a pocket lens. The outer cells often flake off entirely in places, giving the nut a patchy appearance. This is more strictly the velate nut of authors; but the term velate is applied to any nut where the outer cells have been rubbed off partially, which causes the presence of the outer cells to be recognizable under a pocket lens; and it means, with cyperologists, no more than that the outer layer of cells is distinctly recognizable. But in either sense the term velate is (in my opinion) of no (or the very smallest) value.

SECTION II.

Parag. 1. *On the Subgenus* Anosporum.

The abundant Bengal species *Cyperus cephalotes*, Vahl, was proposed as a genus by Nees in hb. Wight as *Ungeria*, a name preoccupied; he therefore published the genus in 'Linnæa' under the name *Anosporum*, and placed it in the tribe Hypolytreæ. Boeckeler published the same species (in 1858) as the genus *Trentepohlia*, which he placed among the Ficineæ; but in his Cyperaceæ Boeckeler admits the prior name *Anosporum*, and removes the genus next *Cyperus*. Finally, Bentham (in 'Flora Australiensis') not merely reduces the plant to *Cyperus*, but does not think it deserving of a section or even subsection of its own; he places it among the Juncelli.

The cause of so great discordance of opinion arises on the question whether the species has any perigynium or not. The final view of Boeckeler is, "Perigynium e squamis constat tribus, quarum una quam reliquæ multo minor; squamæ crassiusculæ stramineæ, basi inter se et pedicello, parte superiore, angulis fructus connatæ ibique evanescentes, v. caryopsin usque ad apicem marginantes et cum styli basi in rostrum complanatum vel teretiusculum connatæ."

Turning at once to my pictures, fig. 1 represents the pistil just before fertilization; there is no trace of perigynium at this time. The ovary is very thin-walled, and its cavity with the ovule is visible through the walls, and is shown in my picture. The narrow-conic base of the style at this time is extremely firm and opaque (quite unlike all other species of *Cyperus*).

Fig. 2 represents the same ovary shortly after fertilization; even before the ovary has sensibly swollen the axis has undergone a rapid prolongation and produced the pedicel. This pedicel appears to spring directly out of the torus; nor do I see that it differs from the base of a carpel in Anonaceæ for instance.

Fig. 3 represents the ripe nut from within (the side pressed against the rhachilla). Figs. 4 and 5 represent two horizontal sections taken one near the base, one near the top of the pedicel; and fig. 6 is the same nut seen from without, the stamens having been removed. In these drawings the closer cells represent the dark-brown body of the nut; the larger paler cells the straw-coloured corky cells of the "squamæ," which are really hardly larger than those of the nut, but are exaggerated a little in the drawing to make a contrast which is really due to colour.

On the inner face of the nut (fig. 3) the tissue of the nut is perfectly continuous with that of the straw-coloured squamæ; there is a perfectly gradual transition of colour from one to the other, both at the base and on the pale-angles. On the back of the nut, however (fig. 6), as it becomes ripe, a chink appears between the base of the nut and the corky scales, which widens into a chasm as the nut gets perfectly ripe. At the same time a small ellipsoidal portion of the corky pedicel splits out by two deep narrow chinks (which, however, never, I believe, proceed further than as shown in cross-section fig. 5); and thus is produced the "third smaller scale" of Boeckeler, firmly connected to the last at its apex with the smaller angle of the nut.

These chinks, imperfect dehiscences, undoubtedly occur in the nut with undeviating regularity. The theory of Boeckeler is that they are the outcome of three scales, which in the younger state of the pistil are connate with and absorbed into it, but which betray the true secret of their origin. This is a theory that cannot be maintained without far more evidence: the position of the three squamæ opposite the stamens does suit their being considered homologous with the squamæ in some other Cyperaceæ. But in the dehiscence of fruit in general, how is it possible to argue back from a circumscissile pyxis (as in *Hyoscyamus*), and to say that the line of dehiscence shows the true base of the ovary?

The style is continuous with the ovary in this species, and persistent on the ripe nut. The style-base is at first terete, but finally unequally 3-winged, strongly serrulate on the margins of the wings. These wings can often be traced under the microscope nearly to the summit of the style. I have attempted to draw, in fig. 3, a very common appearance the wing exhibits (especially in dry specimens) as if it were a narrow bract clinging to the style. Boeckeler rightly states the wings "connate;" they are altogether inseparable, and I see not the slightest ground for regarding these wings as the upper portions of the perigynial scales connate with the style; they much more recall the style-base of some species of *Fimbristylis.*

I think Bentham is perfectly right in replacing this species in *Cyperus.* On the other hand, I place in a subgenus distinct from *Juncellus*, &c., a plant admitted by Arnott, Griffith, Kurz, and F. Mueller as worthy of generic separation. Its differences from other *Cyperi* are considerable: we have first the remarkable "pedicel" of the nut, secondly the persistent style, thirdly sub-undivided stigma. The firm conical base of the style, so prominent even in the young stage of the ovary, is another (or part of the second) character. By these characters the subgenus *Anosporum* is separated from *Juncellus* as from all other subdivisions of *Cyperus.*

I have treated of *Anosporum* here as though of one species, *Cyperus cephalotes*, Vahl. Of the other species placed in *Anosporum* by Boeckeler, I have only one here, viz. *Cyperus platystylis*, R. Br., = *Anosporum pallidum*, Boeck., = *Cyperus pallidus*, Heyne, = *C. caducus*, Steud. The nut of this is shown from the inside in fig. 7, from the back in fig. 8, and in horizontal section in fig. 9. The cells are drawn very much too large in proportion to the scale of the nut, and the horizontal section is more magnified.

The generic character given *Anosporum* by Boeckeler can only be made to include this species by enormous inferences from comparison with *Cyperus cephalotes*. There is no more development of pedicel than in many other *Cyperi*: the style is deciduous, with three branches, essentially as of ordinary *Cyperi*; but it is somewhat short, thick, and more papillose than usual in *Cyperus* (*Fimbristylis*-like), whence R. Brown took his good specific name. As to the corky alteration of the cells, it is very similar to that in *C. cephalotes*; but it does not separate by fissures into three scales (as in *C. cephalotes*), though there is a kind of indication of separation if the nut is compared side by side with that of *C. cephalotes*. On the back of the nut the straw-coloured alteration of the cells proceeds over the whole surface (Benth. et Hook. f. Gen. Pl. iii. p. 1044); but the change only extends to the outermost layer of cells in the centre of the back, while it comprises the whole of the margins of the nut. The change in the nature of the cells where it extends only one layer deep can be easily examined, and is exactly similar to that which takes place in the outermost layer of cells of the nuts of various Cyperaceæ.

It does not appear to me that *Anosporum* can be maintained either as a section or a subsection if this species be placed in it. It has neither the pedicel, the permanent style, nor the entire stigma. The inflorescence is entirely remote. Steudel, no otherwise than Bentham, is right in placing it somewhere near Kunth's Alternifolii, of which it has the umbel, digitate spikelets, and subexalate rhachilla.

I would venture the suggestion that the resemblance of these two species in the nut is accidental to their present habitat, and not a mark of common cousinship. The nuts of most *Cyperi* (even after years in a dry herbarium) sink in water, and remain sunk; when they drop into the rice-sea, they sink to the mud at the bottom, where they germinate. But *C. cephalotes* (*C. natans*, Buch.-Ham.) and *C. platystylis* (*C. fluitans*, Buch.-Ham.) are tank-floaters; their roots are entangled in the mass of rotten *Pistia*, *Salvinia*, &c. in overgrown tanks. Their nuts float in water (and remain floating, as I find experimentally), so that they can germinate in their proper nidus.

Parag. 2. *On* Cyperus pygmæus *and* Isolepis Micheliana.

Cyperus pygmæus, Rottb., and *Isolepis pygmæa* are treated by Kunth (Enum. pp. 18, 203) as two plants, belonging to remote genera, undoubtedly distinct; though from the synonymy quoted it appears that they had been confounded, by reason of superficial resemblances.

Boeckeler, in 'Linnæa,' xxxv. p. 493 (*cf.* Boeck. in 'Flora,' 1871, p. 158), unites the two under one species, *Cyperus pygmæus*; he esteems *Isolepis Micheliana* a form merely "squamis trifariam imbricatis." The number of stamens which he gives for *C. pygmæus* and *I. Micheliana* is a character of no value; the number of stamens in fairly developed *C. pygmæus* is two; but the number is not constant in one spikelet of either species. The glumes of *I. Micheliana* are, however, not trifarious, but on the regular $\frac{3}{8}$ arrangement.

Benth. et Hook. f. Gen. Pl. iii. p. 1044, follow Boeckeler.

I have no doubt that the two plants are amply distinct, and that Kunth's view is correct.

If we examine a good series of the *Cyperus* with ripe nuts, we shall find that though superficially the glumes appear somewhat irregularly placed on the rhachilla, that is not really so. The irregularity disappears under the microscope. The spikelets are densely crowded, hence curved and sometimes twisted as in many other species of *Cyperus*; but if we examine the upper two-third part of a ripe spikelet, the glumes are accurately biseriate, and the rhachilla "alternatim excavata" as in other typical *Cyperi.*

In *I. Micheliana*, on the other hand, the glumes of the upper two-third part of a spikelet with ripe nuts are seen to be on the $\frac{3}{8}$ arrangement with lozenge-shaped scars after they have fallen from the rhachilla. The distinction is so marked that I imagine confusion to have arisen only from examining herbarium specimens of immature heads with a lens. Such specimens with unripe nuts are difficult to separate, even by dissection, because the best characters in support of the foregoing (to separate the two plants) depend on the nut.

The nut of *C. pygmæus* (fig. 10) is, when fully developed, chestnut-coloured, the outer cells are the quadrate cells common in *Cyperus*; the outermost layer is hyaline punctate, but not very thick or lax; so that when the nut is viewed under the microscope it has no hyaline margin all round it.

The nut of *Isolepis Micheliana* (fig. 11) is yellow, or a very pale yellow-brown; the two outer layers of cells are hyaline, inflated, lax; so that when the nut is viewed under the microscope it appears surrounded on all sides by a broad hyaline margin.

This structure of nut is very common in *Isolepis*, unknown in *Cyperus*.

These differences in the nut *invariably accompany* the difference in the arrangement of the glumes (biseriate or $\frac{3}{8}$); so that thereby *Isolepis Micheliana* and *Cyperus pygmæus* are completely carried apart to their several genera.

These differences are supported by a number of trivial characters. In *Cyperus pygmæus* the glumes are ovate-lanceolate or oblong-lanceolate, the filaments ligulate, the anthers somewhat large linear-oblong, the style-branches longer than the nut, the style itself nearly free from papillæ, never 3-fid with me. In *Isolepis Micheliana* the glumes are often somewhat widened at the shoulder, oblong (subobovate) lanceolate; the filaments slender, the anthers small oblong, the style-branches shorter than the nut, the style itself papillose, usually 2-fid, occasionally 3-fid.

In plants that fruit superabundantly as these, a large number of the nuts are never perfected. In *Cyperus pygmæus* a quantity of pale-coloured nuts occur which will be found to contain no perfected seed. These are often not only pale, but marcescent, with very hyaline outermost cells; and they must not be mistaken for the ripe seeds of the *Isolepis*.

Parag. 3. *On* Cyperus alopecuroides *and* C. dives.

Cyperus alopecuroides, Rottb., is a large species with very many spikelets spicate in a large umbel, with a 2-fid style, nut compressed contrary to the rhachilla, and is arranged in Sect. *Juncellus* by Kunth, &c.

C. dives, Delile, is very similar to it in size, bracts, and inflorescence; but has a 3-fid style and strongly trigonous nut. It has been placed next *C. exaltatus*, Retz., and should be considered, I think, a form only of that species.

Boeckeler, in 'Linnæa,' xxxvi. p. 322, unites *C. alopecuroides*, Rottb., and *C. dives*. Benth. et Hook. f. Gen. Pl. iii. p. 1004, say:—

"*C. alopecuroides*, Rottb. (*C. dives*, Delile, Pl. Eg. t. 4), habitu *C.* (*Papyro*) *exaltato*, Retz., accedit, sed nux omnino *Juncelli*, variat tamen stylo 2-fido v. præsertim in speciminibus Africanis 3-fido."

In *C. alopecuroides*, Rottb., the style is *always* 2-fid, the nut always compressed, and moreover the rhachilla (fig. 12) is very stout, with quadrangular excavations (altogether of *Juncellus*), without the vestige of a wing. In *C. dives* (fig. 13) the rhachilla is narrow, with very narrow, almost soluble, yellow wings, as in *C. exaltatus* (and its varieties).

In *C. alopecuroides* the packing of the flat-backed glumes is very similar to that in *C. Monti*: in *C. dives* the boat-shaped glumes are as in *C. exaltatus*, differing somewhat in colour. I esteem *C. alopecuroides*, Rottb., as very distinct from *C. dives.*

C. alopecuroides, Boeck., is mainly founded on *C. amœnus*, Koenig et Roxb. MS. Roxburgh subsequently assumed this to be *C. alopecuroides*, Rottb., despite the difference in style and nuts; he therefore dropped the name *C. amœnus* altogether, and published it as *C. alopecuroides*, Rottb. This is really very near *C. exaltatus*, Retz.; the true *C. alopecuroides*, Rottb., Roxburgh never saw.

Parag. 4. *On* C. inundatus *and* C. procerus.

The most critical of all species is *C. inundatus*, Roxb., a species with bifid style, which so closely resembles *C. procerus*, Rottb. (with trifid style), that the two have been mixed together by Wallich, nor are they easily separable except by the style and nut, the bifid style having a nut compressed contrary to the rhachilla, the trifid style having a distinctly trigonous nut: these two kinds of nut do not occur on one plant. I for some time considered that this was an exceptional *Cyperus*, in which the style was 2-fid or 3-fid in the same species; but I am satisfied, from the full series of specimens in the Calcutta Herbarium, that they are two well distinct species.

I observed first that the compressed nut of *C. inundatus* is very much wider than the trigonous nut of *C. procerus*, and has a very different base. In the species of *Cyperus*, however, with an unequally trigonous nut there is no tendency in the nut to get wider as it gets less trigonous. Moreover the base of the nut of *C. inundatus* has a different shape and structure from the nut of *C. procerus*. Secondly, the rhachilla in *C. inundatus* is thick, with quadrate excavations and central striæ exactly as in *C. Monti*; and the nut is so like that of *C. Monti*, that the species are not easily separated but by the inflorescence. In *C. procerus* the rhachilla is much slenderer, with oblong excavations, narrowly distinctly hyaline-winged. The glumes of *C. inundatus* are very dull-coloured, flat on the back, strongly striated, the margins greatly incurved when dry. The glumes of *C. procerus* are more brightly somewhat yellow- or red-stained, less flat-backed, less strongly plicate-striate, less incurved when dry. The umbel in *C. procerus* is compound, in *C. inundatus* decompound in every example seen: from the analogy of other species it is probable that poor specimens of *C. inundatus* would have a compound umbel; but no example of *C. procerus* (an abundant plant) has the umbel decompound. *C. procerus* has the anthers absolutely muticous, like those of *C. pilosus*; but *C. inundatus* has an obsolete crest to the anther exactly as has *C. Monti.*

I have dwelt on these minute points because *C. inundatus* is the only species of *Cyperus* in which there remains to me any question that a much-compressed and clearly trigonous nut may occur in one species. If this species be allowed to be distinct from *C. procerus,* then we have an absolute distinction to separate *Pycreus* and *Juncellus* from *Eucyperus.*

Parag. 5. *On the Genus* Kyllinga.

Benth. et Hook. f. Gen. Pl. iii. p. 1039, separate the 1-flowered (1-nutted) species of *Cyperus* from *Kyllinga* by the fact that the upper (empty or male) glume is protruded from the flowering (nut-bearing) glume. This is in most cases a working character; but *Cyperus umbellatus,* Benth., shows such a range of variation in this character, that it is impossible to put it forward as the chief diagnostic one: in one of the most abundant forms of *C. umbellatus,* Benth., the upper (barren) glume does not overtop the nut-bearing glume. In another frequent form, hardly distinguishable from this as a variety (*C. pictus,* Wall.), the spikelets are exceedingly similar, but the barren glume is clearly protruded; and from this form we pass on to the linear-spikeleted forms of *C. umbellatus* by insensible gradations.

Boeckeler, in his 'Conspectus Generum,' mentions the two points which separate *Kyllinga* from *Cyperus* (though he does not give contrasted differentiæ), viz. "Spikelets one-flowered upheld on discs, *and* style bifid."

Kyllinga can be separated easily from each subgenus of *Cyperus,* but not (except by alternative cross-referenced diagnostic points) from the genus as a whole. I should therefore have preferred to have made it a subgenus of *Cyperus.*

The subgenus of *Mariscus* includes (for me) all those species (Leptostachyi of Boeckeler and others) in which the glumes are permanent; or at all events do not fall from the spikelet before the spikelet has fallen from the rhachis. The spikelets are in these species very generally "discis impositæ" in the language of Boeckeler; *i. e.* the rhachilla (usually above the two lowest persistent barren glumes) separates by a clean scar, leaving a small disc where it separated. In all the numerous preceding species of *Pycreus, Juncellus, Eucyperus* the glumes fall from the rhachilla (while the rhachilla remains attached) by a clean-cut line separating the glume from its basal portion, which is decurrent down the rhachilla. In all the *Mariscus* set the style is trifid; while in *Kyllinga* the style is bifid. This I take to be the real difference (carrying with it of course a difference in the nut). Boeckeler has, in defiance of his own character, placed three species at the end of *Kyllinga* having a trifid style (hence a triangular nut): these I have not seen, but I suppose they are only small-flowered *Marisci.*

Kyllinga differs therefore from *Mariscus* by its 2-fid style, from *Pycreus* by its 1-flowered spikelets.

[The number of fertile flowers to the spikelet is no use as a diagnostic character: in *Cyperus flavus* there are sometimes five or six nuts to the spikelet, though it is admittedly a typical *Mariscus.*]

SECTION III. (*Conspectus generis.*)

CYPERUS, *Linn.*

Spiculæ ∞–1-nucigeræ; flores, nisi 2–1 basi, 1–2 apice, omnes hermaphroditi. Glumæ distichæ. Setæ hypogynæ 0. Stamina 3–1.—Inflorescentia umbellata interdum capitato-umbellata.

Series A.

Glumæ deciduæ; *i. e.* antequam spiculæ rhachilla a rhachi (spicæ axi) sejuncta fuerit, glumæ (a basi spiculæ gradatim) ope concisuræ rectæ decidunt.

Subgenus 1. ANOSPORUM. Stylus subindivisus. Nux stipitata.
  „ 2. PYCREUS. Stylus 2-fidus. Nucis compressæ margo rhachillæ adjectus.
  „ 3. JUNCELLUS. Stylus 2-fidus. Nucis compressæ facies rhachillæ adpressa.
  „ 4. EUCYPERUS. Stylus 3-fidus. Nux (interdum inæqualiter) trigona aut subrotunda.

Series B.

Glumæ persistentes; *i. e.* spiculæ rhachilla a rhachi (omnino vel per articulos) sejungitur, antequam glumæ a rhachilla decidunt.—Stylus trifidus.

Subgenus 5. DICLIDIUM. Spiculæ rhachilla per articulos disjuncta.

„ 6. MARISCUS (char. amplif.). Spiculæ rhachilla continua basi, sæpissime (an semper?) supra 2 imas glumas vacuas, sejuncta.

N.B. *Marisci*, in speciebus nonnullis, spiculæ exstant 1-nucigeræ; ab his *Kyllinga* stylo 2-fido, *Courtoisia* stylobasi pyramidato persistente, cognosci possunt.

Subgenus 1. ANOSPORUM.

[See Sect. II. parag. 1 *suprà* for the numerous characters by which this plant (I here treat *C. cephalotes* as the only species of the subgenus) stands apart from *Cyperus*.]

1. C. CEPHALOTES (*Vahl, Enum.* ii. p. 311); umbella dense capitata; stylo indiviso aut obscure 3-lobo; nuce stipitata, cellulis angulorum suberosis stramineis.—*Spreng. Syst.* i. p. 218, *syn. excl.*; *Kunth, Enum.* ii. p. 28; *Benth.*! *Fl. Austral.* vii. p. 263.

C. monocephalus, *Roxb. Hort. Beng.* p. 5; *Fl. Ind.* i. p. 188 (*non Roxb. Ic. ined. in h. Kew.*).
C. leucocephalus, *Wight MS. in h. propr., non Retz.*
C. monocephaloides, *Roxb.*! *Ic. ined. in h. Kew.*
C. Hookerianus, *Thwaites*! *Enum. Pl. Zeyl.* p. 342, *non Arn.*
C. kyllingiæoides, *Willd. h.* 1309, plag. 1 (*fide Boeck.*), *non Vahl.*
? C. monogynus, *Boeck. in Linnæa,* xxxv. p. 565.
C. natans, *Buch.-Ham. MS. in h. propr.*
Anosporum monocephalum, *Nees*! *in Linnæa,* ix. p. 287; *in Wight, Contrib.* p. 92; *Endl. Gen. Pl.* p. 117; *Arn. in Edinb. New Phil. Journ.* xvii. (1834) p. 263; *Griff. Notul.* iii. p. 103; *Boeck. in Linnæa,* xxxvi. p. 411; *F. Muell. Fragm. Phyt. Austral.* viii. p. 272.
A. cephalotes, *Kurz*! *in Journ. Asiat. Soc.* xlv. (1876) pars 2, p. 159.
Ungeria monocephala, *Nees*! *in Wight h. propr.* n. 1855.
Trentepohlia bifoliata, *Bœck. in Bot. Zeit.* 1858, p. 249.
Cyperus sp. n. 21 bis, *Herb. Ind. Or., Hook. f. et T. Thoms.*
Kyllingia, *Wall.*! *List* n. 3441, litt. A, D partim.

In udis radicans, aut sæpe in lacubus natans, perennis; stolones tenues lenti. Culmi 1–4 dm., sursum trigoni leves. Folia

2–5, cum ⅔ parte culmi æquilonga, plana, graminea, sursum scabra. Bracteæ 3–5, 2–20 cm. longæ, divaricatæ, foliis similes. Umbella in diam. 5–20 mm., 10–70-spiculosæ; radii 3–5, obsoleti. Spiculæ longæ 5–10 mm., latæ 3–4 mm., compressæ, sæpe curvatæ, 10–24-floræ; rhachilla validior, compressa; alæ angustæ, persistentes; gluma ima parva, vacua. Glumæ longæ 2–3 mm., late ovatæ subacutæ, naviculari-concavæ, subcoriaceæ, in dorso virides, aliquando minute scabridæ, in lateribus stramineæ aut sæpe castaneæ. Stamina 3 (fide Bentham haud raro 2), hypogyna, libera: filamenta late ligulata, levia; antheræ lineari-oblongæ, flavidæ; connectivum vix brevissime excurrens, scabrum, rubrum. Perigonium nullum, aut saltem nullo tempore a pistillo (nisi ruptura) separabile. Stylus nuce longior; basi dilatatus in nucem sensim decurrens, cum hac continuus, persistens. Nux ovoidea, curvata, fusca, contra rhacheolam compressam, ob nervum dorsalem tenuissimum, inæqualiter 3-gona; anguli fructus tempore, præsertim stipitis, spongioso-incrassati; stylobasis laxe triquetra, in angulis scabra.

India et Malaya, in regione tropicali; ab Assam usque ad Zeylaniam, China, et Australiam borealem.

Bengalia: vulgaris (*Wallich, hh. Kew., Linn. Soc.*; *Wallich* n. 3441 A, D, *h. Calcutta, &c.*).

Assam: vulgaris (*Griffith* n. 1609, *h. Kew*; *Simons*, n. 26, *h. Calcutta*); Gowhatty (*Nuttall, h. Mus. Brit.*); &c.

Madras Peninsula (*Wight* n. 1855, *hh. propr., Kew, Mus. Brit.*; *Wight* n. 2919, *h. Calcutta*).

Zeylania (*Thwaites, C. P.* n. 3221, *hh. Kew, Mus. Brit., Calcutta*).

Burma (*Griffith* n. 6172, *hh. Kew, Calcutta*).

Pegu (*Kurz* n. 2670, *hh. Kew, Calcutta*; n. 646 bis, *h. Calcutta*); Bhamo (*J. Anderson, h. Calcutta*).

Amoy (*Jenkins, h. Mueller*).

Borneo: Banjermassing (*Motley* n. 1261, *h. Kew*).

Batavia (*J. B., h. Mus. Brit.*).

Australia: Sinus Rockingham (*Dallachy, h. Kew*).

Subgenus 2. PYCREUS.

Pycreus, *Beauv. Fl. d'Owar.* ii. p. 48, t. 86, fig. 2; *Nees in Linnæa*, ix. p. 483.—Torreya, *Rafinesque in Journ. de Phys.* lxxxix. p. 105.

Stylus 2-fidus; rami lineares. Nux plus minus compressa, fere symmetrica; margo rhachillæ adjectus.—Umbellulæ nudæ vel a bracteis parvulis suffultæ. Spiculæ multi-(10–60-)floræ, persistentes. Rhachillæ alæ angustæ, persistentes, hyalinæ, interdum purpureo-maculatæ. Filamenta 1–2–3, ligulata, parum dilatata, sæpissime (interdum conspicue) papilloso-scabrata; antheræ muticæ aut vix apicatæ, nec cristatæ.

Glabræ. Species plures annuæ; paucissimæ stoloniferæ aut late repentes; omnes typice foliaceæ, exempla pauca foliis omnibus ad vaginas depauperatis reperiuntur, mihi varietates meræ. Formæ pygmææ (imo acaules), interdum 1–4 cm. longæ, in pluribus speciebus bene notis visæ sunt.

This is the most natural and the most easily separable subgenus of all in *Cyperus*; and few differences of opinion have occurred as to the position of any of its species. I have removed, however, two (*C. diaphanus*, Schrad., and *C. Barteri*, Boeck.) into *Juncellus*. Of these, probably, Boeckeler had not the ripe nut.

A single detached nut of *Pycreus* can generally be known from one of *Juncellus* by the fact that its two halves, made by a plane through its broadest part, are similar (fig. 42); whereas in *Juncellus* they are not (fig. 44), owing to the upper part of the nut being always more or less curved inwards towards the rhachilla. But the nut of *Pycreus* is not rarely somewhat unsymmetric in the other plane (fig. 44), owing to the margin of the nut on one side being pressed against the rhachilla; this is a marked character in some species, as in *C. sulcinux* below.

* *Cellulæ extimæ nucis oblongæ* (figs. 40, 41).

† *Species in Indiâ Orientali indigenæ.*

2. C. FLAVESCENS (*Linn. Sp. Pl.* p. 68, *nec Linn. h. propr.*); umbella specie simplice aut subcapitata; bracteis 3–4, divaricatis, umbella longioribus; spiculis multifloris, lineari-oblongis, compressis, subturgidis; glumis ovatis, obtusis, flavescenti-stramineis; nuce cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga obscurius transversim notata.—*Lam. Ill.* t. 38. fig. 1; *Roem. et Sch. Syst.* ii. p. 191; *Host, Gram.* iii. t. 72; *Bertol. Fl. Ital.* i. p. 261; *Sibth. Fl. Græc.* t. 47; *Reichb. Ic. Fl. Germ.* t. 278. fig. 662–664; *Poit. et Turp. Fl. Paris.* t. 74 (non visa); *Fl. Dan.* t. 1682; *Sturm, Fl. Deutsch.* xiii. t. 52 (opt.); *Anders. Cyp.* p. 1, t. 1. fig. 1; *Ledeb. Fl. Ross.* i. p. 239 (var. β excl.); *Gren. et Godr. Fl. Fr.* iii.

p. 362; *Parl. Fl. Ital.* ii. p. 26; *Asa Gray, Man.* p. 552; *Torrey in Ann. Lyceum New York*, iii. p. 250; *Boeck. in Linnæa*, xxxv. p. 438; *Boiss. Fl. Or.* v. p. 364 (ex Afgh. excl.); *Coss. Expl. Algér., Bot.* iii. p. 254 (*nec Schk. Handb.* t. 7, *nec Benth. Fl. Austral.* vii. p. 259, quoad ex Australia).

C. xanthinus, *Presl in Oken Isis*, xxi. p. 271, *fide Steud.*
C. poæformis, *Pursh. Fl. Amer. Sept.* i. p. 50; *Kunth, Enum.* ii. p. 113; cf. *Torrey in Ann. Lyceum New York*, iii. p. 250.
C. Gussoni, *Gasp.! in Guss. Syn. Fl. Sicul.* ii. Add. p. 779.
C. setaceus, *Wulfen. Fl. Norica*, p. 49, *non Retz.*
Pycreus flavescens, *Reichb. Fl. Germ.* p. 72; *Nees, Gen. Pl. Germ.* ii. t. 22, fig. 14–16.
— *Moris Hist.* iii. p. 239, sect. 8. t. 11. fig. 37. — *Bauh. Theat.* i. p. 89, cum ic. — *Scheuz. Agr.* p. 386, t. 8. fig. 13.

Glabra, cæspitosa, radicibus fibrosis. Culmi 1–5 dm., sursum trigoni, leves. Folia 2–4, cum $\frac{2}{3}$ parte culmi subæquilonga, angusta, levia. Bracteæ longæ 1–8 cm., foliis similes. Umbellæ radii 2–5, longi 0–5 cm., plerumque breves; ochreæ breviter cylindricæ, unidentatæ. Umbellulæ congestim corymbosæ, ebracteatæ, radiolis brevissimis, 1–3-spiculosis, aut e spica simplice constantes. Spiculæ in unoquoque radio 3–10, fasciculatæ aut breviter spicatæ, longæ 5–18 mm. latæ 3 mm., 10–40-floræ; rhachilla exalata; gluma ima lanceolata, bracteæformis, cæteris subbrevior. Glumæ spissæ, subturgidæ, in dorso viridi-3-nerviæ, in lateribus enervosæ, nitidæ aut fuscæ. Stamina 3; antheræ anguste oblongæ, muticæ. Stylus nuce brevior; rami 2, e gluma breviter exserti. Nux obovoidea, obtusa, apicata, modice compressa, nigrocastanea; cellulæ extimæ longitudinaliter oblongæ (3–4plo longiores quam latæ), emarcidæ, hyalinæ, detergibiles; ideoque nux plus minus transversim a lineis undulatis albidis interruptis notata.—Exemplum authenticum *C. flavescentis*, in h. Linn. proprio conservatum est *C. rivularis*: idcirco cl. Boott exempla Americana *C. rivularis*, in h. Mus. Brit. conservata, manu sua "*C. flavescens*, Linn.," nominavit.

Regio Mediterranea, ab Holstein et Algiers usque ad Cabul; America borealis calidior; Varr. usque ad Natal et Brasil extensis.

Europa: Berlin (*Reichenbach* n. 151, *hh. Kew, Mus. Brit.*); Frankfort (*Lawrence, h. Calcutta*); Palermo (*Todaro, h. Calcutta*); Switzerland (*W. Hooker, h. Calcutta*); Portugal, Cintra (*Welwitsch* n. 340, *hh. Kew, Mus. Brit.*).

Africa: Algiers (*Lefranc* n. 485, *h. Mus. Brit.*).

Asia: Syria (*Lowne in h. Calcutta*); Persia (*Haussknecht, hh. Kew, Mus. Brit.*); Cabul, in valle Kurrum (*Aitchison* n. 964, *hh. Kew, Mus. Brit., Calcutta*).

America: Kentucky, Lexington (*Peter, h. Kew*); Florida (*Chapman, h. Calcutta*); New Orleans (*Drummond, hh. Kew, Calcutta*).

Sine habitat. *Agrostotheca,* Sieber n. 105, hh. Kew, Mus. Brit.

Var. *β. abyssinica*; evolutior, sæpe lucida; nuce sæpe conspicue transversim notata.

C abyssinicus, *Hochst.*! (sp.); *Steud. Cyp.* p. 4; *Boeck. in Linnæa,* xxxv. p. 440, *non Oliver.*

C. flavescens, *A. Rich. Fl. Abyss.* ii. p. 474.

Mihi forma, vix varietas.—In Schimper, n. 122 in h. Kew, alterum exemplum nota (?) affixum est *C. Eragrostis*, Vahl.

Alpes Maritimi: Mentone (*Moggridge, h. Kew*).

Madeira: (*Burchell* n. 634, *h. Kew*; *Mandon* n. 253, *hh. Kew, Mus. Brit.*).

Abyssinia: Adoa (*Schimper* n. 122 partim, *h. Kew*); Tigré (*Schimper* n. 297, *h. Mus. Brit.*).

Africa Centralis: Bongo (*Schweinfurth* n. 1433, *h. Kew*); Gazelle Fl. (*Schweinfurth* nn. 1173, 1251, *h. Kew*); Gallabat (*Schweinfurth* no. 2011, *hh. Kew, Mus. Brit.*).

Natal (*Buchanan* no. 309, *h. Kew*; *Gerrard* n. 489, *h. Kew*).

Var. *γ. paraensis*, Boeck. in Linnæa, xxxv. p. 439; culmis fere a basi trigonis; spiculis interdum angustioribus subfuscis.

Cyperus paraensis (sp.), *Steud. Cyp.* p. 5.

Pycreus paraensis (sp.), *Nees in Mart. Brasil., Cyp.* p. 8.

In forma typica hujus varietatis, spiculæ angustæ subfuscæ a *C. flavescente* recedunt; sed exempla optima Gardneri a *C. flavescente* typ. vix distingui possunt.

Brasilia Australis: S. Catharine (*h. Kew*).

Brasilia Tropica: Piauhy (*Gardner* n. 2383, *hh. Kew, Mus. Brit.*).

Var. *δ. Fontanesii*; culmis tenuissimis, foliis filiformibus; spiculis in unoquoque culmo 2–6, quam *C. flavescentis* typici paullo angustioribus; glumis pallidis, in dorso viridibus, in lateribus albidis vix luteo-tinctis.

C. Fontanesii (sp.), *Kunth, Enum.* ii. p. 5; *Boeck. in Linnæa,* xxxv. p. 438.

C. stramineus, *Desf. MS.*

Causa glumarum minus spisse imbricatarum, bractearum divaricatarum, *C. flavescenti* quam *C. stramineo* affinior. Mihi videtur forma hortulana, invalida aut morbosa, in hypocaustis fortasse culta. Nux &c. omnino *C. flavescentis.*—Exempla parvula (non culta) *C. flavescentis,* culmis 5–6 cm. longis 1–5-spiculosis, a *C. Fontanesii* tamen longius distant culmis multo minus tenuibus, spiculis latioribus, flavescentibus.

Patria ignota (*in horto Kew culta, h. Calcutta*).

3. C. STRAMINEUS (*Nees*! *in Wight Contrib.* p. 74); umbella pauciradiata, congesta, spiculis laxius antice fastigiatis, bracteis 2, longiore jam fructus tempore erecto; spiculis lineari-oblongis, multifloris, stramineis; glumis spissis, ovatis, subacutis.—*Kunth, Enum.* ii. p. 9.

C. capillaris, *Hochst.*! *in Pl. Hohen.* n. 302, *non Koen.*

C. coromandelinus, *Boeck.*! *in Linnæa,* xxxv. p. 480, *non Spreng.*

Cyperus, *Wall.*! *List* n. 3320 B partim.

Cyperus, *Wall.*! *List* n. 3318 partim.

Cyperus, *Wall.*! *Cyp. indet.* n. 1.

Glabra, cæspitosa; radicibus fibrosis, a nota Hooker filii aromaticis. Culmi 1–3 dm., tenuiores, curvati, sursum obscurius trigoni, leves. Folia 3–5, cum culmo sæpe æquilonga, angusta, levia. Bracteæ 2, rarius 3, major usque ad 8–10 cm. longa, erecta, fere quasi culmi continuatio. Umbellæ radii 1–4, rarius 1–3 cm. longi, sæpius brevissimi, 5–15-spiculosæ. Spiculæ longæ 10–35 mm., latæ 2–3 mm.. 15-70-floræ, leviter compressæ; rhachilla fere exalata; gluma ima parva, ovata, bracteæformis. Glumæ carinatæ, subturgidæ, in dorso viridescentes 1–3-nerviæ, in lateribus enervosæ, luteo-hyalinæ. Stamina 2; filamenta persistentia, squamoso-papilloso-scabra; antheræ lineari-oblongæ, muticæ, flavæ. Stylus nuce subbrevior; rami 2, e gluma plane exserti. Nux cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, obovoidea, leviter compressa, obtusa, breviter apicata, nigra; cellulæ extimæ longitudinaliter oblongæ, emarcidæ, albidæ, detergibiles, ideoque nux transversim interrupte albo-notata.—A *C. flavescente* (quoad exempla hujus parvula monocephala) vix, nisi a bracteis fructus tempore suberectis, distinguenda.—In Thwaites C. P. n. 3776, bracteæ 3, subpatulæ sed glumæ subacutæ.—*C. coromandelinus,* Spreng., cum *C. pectinato*, Roxb., mere synonymus, "squamis apice recurvis &c." est *C. Wightii*, Nees,=*C. rubicundus*, Vahl.

India, alt. 0–1000 metr.: in planitie Bengaliæ orientalis frequens, aliunde rarius communicata.

Bengalia: Khasia (*J. D. Hooker et T. Thomson, h. Calcutta*); Mymensingho (*C. B. Clarke* nn. 7956, 8023); Sylhet (*Wallich* n. 3320 B, *h. Calcutta*); Chittagong (*J. D. Hooker* n. 158, *h. Kew*).

Madras Peninsula: Mangalore (*Hohenacker* n. 302, *hh. Kew, Mus. Brit.*).

Zeylania (*Thwaites C. P.* n. 3776, *hh. Kew, Calcutta*).

Burma: Arracan (*Kurz* n. 676, *h. Calcutta*); Mergui (*Griffith* n. 166, *h. Kew* n. 6169); Tavoy (*Wallich* n. 209, *h. Linn. Soc., non Wall. List* n. 209).

4. C. LATISPICATUS (*Boeck. in Flora*, 1859, p. 441, *in Linnæa*, xxxv. p. 467); umbella specie simplice aut capitata; spiculis magnis, compressis, multifloris; glumis spissis, ovatis, obtusis, castaneo-luteis aut castaneo-rubris; nuce cum ⅓ parte glumæ æquilonga, obovoidea.

C. intermedius, var. indica, *Boeck. in Linnæa*, xxxv. p. 451, *non Steud.*

C. pseudo-bromoides, *Boeck.* (*quoad ex Nepalense*) *in Linnæa*, xxxv. p. 464.

Cyperacea, *Griff. Itin. Notes*, p. 32, n. 506.

Glabra, cæspitosa; radicibus fibrosis. Culmi 2–3 dm., sursum trigoni, leves. Folia brevia, sæpe brevissima, apice minute scabra. Bracteæ 3–4, usque ad 8–12 cm. longæ, divaricatæ, foliis similes. Umbellæ radii 3–5, usque ad 9 cm. longi, aut sæpius 1-3, breves vel subnulli; ochreæ 1 cm., fuscæ, truncatæ. Umbellulæ congestim corymbosæ, ebracteatæ, radiolis brevissimis, 2–3-spiculosis, aut e spica simplice constantes. Spicæ 3–9-spiculosæ, ebracteatæ. Spiculæ longæ 2 cm., latæ 3–4 mm., 30–40-floræ, lateribus parallelis; rhachilla tetragona, fere exalata; gluma ima parva, obtusa. Glumæ carinatæ, subturgidæ, in dorso virides, 3–5-nerviæ, in lateribus enervosæ, lucidæ. Filamenta 2, persistentia, squamoso-papillosa; antheræ lineari-oblongæ, muticæ aut vix apicatæ, rubescentes. Stylus nuce subbrevior; rami 2, e gluma brevius exserti. Nux obtusa, breviter apicata, leviter compressa, castanea, lucida; cellulæ extimæ longitudinaliter oblongæ, emarcidæ, hyalinæ vix detergibiles, ideoque nux non aut vix transversim notata. —Species a cl. Boeckeler ab exemplo manco haud bene evoluto descripta; in herbariis cum *C. unioloide* var. *angulata* sæpe confusa, a Bentham cum *C. flavescente* recte collata, a quo differt spiculis latioribus, glumis plus minus castaneis.—In exemplis Khasianis (forma typica Boeckeleri) umbella sæpius contracta: exempla in India Centrali lecta multo majora sunt, umbella longius radiata, spiculis longis 32 mm., latis 5–6 mm., 50–floris.

India centralis et boreali-orientalis; frequens.

Khasi colles, alt. 1000 metr. (*J. D. Hooker, hh. Kew, Calcutta*; *Griffith* n. 506, *h. Kew* n. 6200 partim; *Griffith* n. 506, *h. Calcutta*).

Assam (*Masters* n. 198, *h. Kew*; *Jenkins, h. Calcutta*).

Bengalia orientalis (*Griffith* n. 6200, *h. Calcutta*).

Sikkim Terai (*Kurz, h. Calcutta*).

Chota Nagpore: Hazaribagh alt. 600 metr. (*C. B. Clarke* n. 21208, *hh. Kew, Calcutta*).

India centralis: Sumbulpore (*h. Calcutta*).

Var. *β. acaulis*: culmo nullo; spica centrali in radice annua plane sessili; radiis 1–4, basi ochreatis, 1–7 cm. longis.

Khasi colles, alt. 1200 metr.: Cherra (*C. B. Clarke* n. 15165, *h. Kew*).

Var. *γ. aphylla*; culmo 8-pollicari, ima basi a vaginis efoliatis vestito.

C. aphyllus (sp.), *Boeck. in Linnæa*, xxxv. p. 450.

Non visa; Boeckeleri descriptio in omni parte cum exemplis *C. latispicati* quadrat. In *C. latispicati* exemplis folia sæpe brevissima videntur.

India Orientalis; "comm. a W. Arnott in Reliq. Lehmann." —*Boeck.*

5. C. PAUPER (*Hochst.*; *A. Rich. Fl. Abyss.* ii. p. 478); culmo tenui 1–2 spiculas proferente; involucri bracteis 2, altero suberecto; nuce subglobosa, nigra, cellulis extimis oblongis.—*Steud. Cyp.* p. 5 (culmi descriptione confusa); *Boeck. in Linnæa*, xxxv. p. 451.

C. angulatus, *Strachey, Cat. Pl. Kumaon*, p. 74, *non Nees.*

Annua, tenuis. Folia angustissima, cum culmo interdum æquilonga. Involucri bractea altera, 4–6 cm. longa, quasi culmum producens, proventu suberecta. Spicula (sæpius solitaria) longa 1 cm., lata 4 mm., late lanceolata, paullo-compressa, 8–16-flora; rhachilla subexalata. Glumæ leviter imbricatæ, ovatæ, vix acutæ, turgidæ, obscure carinatæ, luteo-brunneæ, in dorso viridi-3-nerviæ, apice sæpe castaneæ. Stamina 2. Stylus brevis; rami 2 e gluma breviter exserti. Nux cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, vix compressa; cellulæ extimæ albescentes, inconspicuæ.

Abyssinia (*Schimper* n. 1602, *hh. Kew, Mus. Brit.* cum *Fimbristylide* intermixta; *Schimper* n. 1311, *hh. Kew, Mus. Brit.*; *Schimper* n. 1243, *h. Kew admixta*).

Himalaya occidentalis (*Munro, h. Kew*): Kumaon, alt. 1800 metr. (*Strachey et Winterbottom, h. Kew*); Sikkim (*J. D. Hooker, h. Calcutta*).

†† *Species in Indiâ Orientali nondum repertæ.*

6. C. MACRANTHUS (*Boeck. in Linnæa,* xxxv. p. 462); umbella pauciradiata, contracta aut capitata; spiculis magnis, compressis, nigro-castaneis; glumis ovatis, obtusis; nuce cum $\frac{1}{4}$ parte glumæ vix æquilonga, cellulis extimis oblongis.

C. permutatus, *Boeck. in Linnæa,* xxxv. p. 477.

Africa australis (*Zeyher* n. 1745, *hh. Kew, Mus. Brit.*); Macalisterberg (*Burke, h. Calcutta*); Boschberg (*MacOwan* n. 1365, *h. Kew,* n. 1362, *h. Mus. Brit.*); Natal (*Wood, h. Kew*; *Sutherland, h. Kew*; *&c.*).

7. C. NIGRICANS (*Steud. Cyp.* p. 12); umbella contracta, 1–3-radiata aut capitata; glumis majusculis, nigris, in dorso viridibus; nuce obovoidea, vix compressa, cellulis extimis oblongis. —*A. Rich. Fl. Abyss.* ii. p. 476; *Boeck. in Linnæa,* xxxv. p. 462.

Abyssinia (*Schimper* nn. 1286, 1373, *hh. Kew, Mus. Brit.*).

8. C. LANCEOLATUS (*Poir. Encyc.* vii. p. 245); umbella 1-pauciradiata, radiis brevibus; spiculis multifloris, oblongis, subturgidis; glumis ovatis obtusis, in latere castaneo-rubescentibus; nuce ellipsoidea, brunnescente, cellulis extimis oblongis.—*Kunth, Enum.* ii. p. 9; *Boeck. in Linnæa,* xxxv. p. 442.

C. intermedius, *Steud. in Flora,* 1842, p. 581; *A. Rich. Fl. Abyss.* ii. p. 483 (sub *Eucypero perperam ordinata*); *Boeck. in Linnæa,* xxxv. p. 450, var. β excl.

C. Eragrostis, *Krauss in Flora,* 1845, p. 754, *non Vahl.*

Abyssinia (*Schimper* n. 1267, *hh. Kew, Mus. Brit.*; *Schimper* n. 1243, *h. Mus. Brit., h. Kew partim*).

Madagascar (*Blackburn, h. Kew*).

This species is remote from *C. Eragrostis* by the surface-cells of the nut; it stands between *C. flavescens* and *C. latispicatus,* differing from the latter in its smaller spikelets, from the former in its chestnut-red colour.

9. C. TRISTACHYUS (*Boeck. in Linnæa*, XXXV. p. 455); umbellæ radiis paucis, breviusculis; spiculis paucis, subspicatis; glumis ovatis, obtusis, fuscis; nuce obovoidea, compressa, cellulis extimis oblongis.

America australis: Columbia, Merida (*Moritz, hh. Kew, Mus. Brit.*); Panama (*Seemann, h. Calcutta*); Venezuela (*Fendler* n. 1586, *h. Kew*); Bolivia, alt. 2700 metr. (*Mandon* n. 1393, *h. Kew*); Respublica Argentina (*Grisebach, h. Kew*).

This differs a little from *C. lanceolatus* in the more obovoid nut.

10. C. PICEUS (*Liebm.*! *Mex. Halfgr.* p. 12); umbellæ radiis paucis, brevibus aut subnullis; spiculis lineari-oblongis, compressis, castaneo-rubris; nuce obovoidea compressa, cellulis extimis oblongis.

C. picreus (err. typogr.), **Boeck. *in Linnæa*, xxxv. p. 455 *in notâ*.**

Mexico, alt. 1500 metr. (*Liebmann, h. Kew*) (*F. Mueller* n. 1987 partim, *h. Kew*).

In the few examples examined I found stamens 3, whereas in *C. tristachyus* stamens 2.

** *Cellulæ extimæ nucis quadratæ* (figs. 35–39).

† Umbella specie simplex aut capitata, rarius (in varietatibus *C. polystachyi, C. atronitentis, C. Mundtii*) composita, umbellularum radiolis elongatis.

‡ *Species in Indiâ Orientali indigenæ.*

11. C. PUMILUS (*Linn.*! *h. propr.*, *Amœn. Acad.* iv. p. 302, *Sp. Pl.* p. 69, *nec Rottb.*, *nec Nees*); umbella specie simplice aut congesta; spiculis fasciculatis aut breviter spicatis aut congestim corymbosis, linearibus, pallidis aut fuscis; glumis spissis, subrecurvo-mucronatis; stamine sæpius 1; nuce obovoidea, obtusa, apicata cum $\frac{1}{3}$ parte glumæ vix æquilonga.—*Gærtn. Fruct.* i. p. 9, t. 2. fig. 2; *Vahl, Enum.* ii. p. 330; *Roem. et Sch. Syst.* ii. p. 188; *Kunth, Enum.* ii. p. 4 *pro minore parte*; *Steud. Cyp.* p. 3 *partim*; *Roxb. Fl. Ind.* i. p. 196, *syn. Rottb. excl.*; *Benth. Fl. Austral.* vii. p. 258.

C. nitens, ***Vahl, Enum.*** ii. p. 331; ***Kunth, Enum.*** ii. p. 3; **Boeck. *in Linnæa*, xxxv. p. 483, *non Retz.***

C. membranaceus, *Vahl, Enum.* ii. p. 330; *Kunth, Enum.* ii. p. 3.
C. pulvinatus, *Nees et Meyen! in Wight Contrib.* p. 74; *Thwaites, Enum. Pl. Zeyl.* p. 342.
C. gymnoleptus, *Steud.! Cyp.* p. 3.
C. patens, *Hochst.! in Pl. Hohen.* n. 825.
C. obstinatus, *Steud.! Cyp.* p. 10.
Pycreus pulvinatus, *Nees in Nov. Act. Nat. Cur.* 1843, *Suppl.* ii. p. 53.
Cyperus, *Wall.! List* n. 3312 litt. F, K, I, L, M; litt. B, C, D, E, partim.
Cyperus, *Wall.! List* n. 3339 (*non* C. tortuosus, *Roxb.*).
Cyperus, *Wall.! List* n. 3376 partim (*admixt.*).
— *Pluk. Alm.* t. 191. fig. 8.

Annua, glabra, radicibus tenuiter fibrosis. Culmi 1–25 cm., sursum trigoni, leves. Folia 2–4, cum culmo sæpe æquilonga, angusta (lata 1–3 mm.), levia. Bracteæ 3–5, longæ 1–15 cm., patulæ, foliis similes. Umbella 1–6-radiata; radii usque ad 9 cm. (sæpius 0–3 cm.) longi; ochreæ truncatæ. Umbellulæ 5–30 spiculosæ, ebracteatæ, simplices, vel compositæ, radiolis 0–2 mm. longis. Spiculæ undique patulæ, longæ 5–18 mm., latæ 1–2 mm., compressæ, 8–44-floræ, virides membranaceæ, nitidæ aut fusco-brunneæ; rhachilla vix alata; gluma ima cæteris minor, lanceolata, bracteæformis; altera truncata, vacua. Glumæ fertiles ovatæ, longæ 1–2 mm., naviculares, imbricatæ (in forma *C. patente* sp. Hochst. subremotæ), ovatæ, apice emarginatæ, in dorso viridi-3–5-nerviæ, nervis apice coalitis in forma mucronis brevis subrecurvati excurrentibus; glumæ latera scariosa aut fusca, ecostata. Stamen in forma typica semper 1; filamentum sursum minutissime squamoso-papillosum, deciduum; anthera parva, oblonga, mutica, lutea. Stylus brevis (nuce brevior); rami 2, e gluma vix exserti. Nux parvula, compressa, nigro-castanea; cellulæ extimæ subquadratæ, emarcidæ, hyalinæ, inflatæ, sæpe porosæ.

In h. Linn. propr. planta a manu Linnæi "*C. pumilus*" notata in centro plagulæ affixa est; in altero latere fragmentum, ex hort. Fothergill a J. E. Smith (?) additum, est *C. flavescens*. Species a Pluk. Alm. t. 191. fig. 8, Gærtn. Fruct. t. 2. fig. 2 stabilita est, quæ tabulæ speciei formam vulgarem optime exhibent; ab hac paullo recedunt formæ sequentes:—

Forma *membranacea* sp., Vahl, Enum. ii. p. 330, spicis magis laxis; forma in var. γ. punctatam forsan transeuns, sed stamen 1.

Forma *patens* sp., Hochst. (=Wall. List n. 3339), glumis subremotis, nuce sæpe pallidiore; forma in *C. pumilum* typ. sensim transeuns.

Forma *borneensis*, a Burbidge in Borneo lecta in hh. Kew, Mus. Brit. conservata, elegans, læte albida, culmis elongatis, nuce (ob cellulas extimas laxe saccatas) specie papillosa aut scabro-punctata.

In exemplo in Rangoon a R. Scott lecto, umbellularum radioli usque ad 5 mm. longi. In exemplo in Assam a Simons lecto, umbellula plane composita a bracteola 15 mm. longa foliæformi suffulta.

In omni India, alt. 0–1500 metr., ab Himalaya usque ad Zeylaniam et Malacca, communis; in Asia, Australi-orientali et Malaya usque ad Ins. Philippinenses, et (var. incl.) Australiam tropicalem.

India: Kumaon (*Strachey et Winterbottom* n. 3, *h. Kew*); Dehra Doon (*G. King, h. Calcutta*); Sikkim (*G. King, h. Calcutta*); Assam (*Jenkins et Masters, h. Kew* n. 199); Bengal (*Griffith, h. Kew* n. 6213); Mons Aboo (*G. King, h. Calcutta*); Chota Nagpore, alt. 600 metr. (*C. B. Clarke* n. 20419); Madras Peninsula (*Wight* n. 1809, *h. Kew*; *Hohenacker* nn. 825, 826, *h. Kew*; *Hohenacker* n. 825, *h. Mus. Brit.*); Zeylania (*Thwaites C. P.* n. 806, *hh. Kew, Mus. Brit., Calcutta*; *Beckett* n. 2541, *h. Calcutta*); Burma et Malacca (*Griffith, h. Kew* n. 6186).

Borneo (*Motley* n. 274, *h. Kew*).

Ins. Philippine (*Cuming* n. 559, *hh. Kew, Mus. Brit.*).

Var. *β. mutica*; glumæ nervo medio vix aut brevissime excurrente.—*C. nitens*, varr. γ et δ, Boeck. in Linnæa, ix. p. 484.

C. patens, *Vahl, Enum.* ii. p. 334; *Kunth, Enum.* ii. p. 16.
C. truncatulus, *Steud.*! *Cyp.* p. 10.
C. squarrosus, *Kotschy*! *Iter. Nub.* n. 53, *non. Linn.*
C. commutatus, *Steud.*! *Cyp.* p. 10.

Stamina 2, in exemplis paucis examinatis. *C. patens*, Vahl, differt a var. *mutica*, Boeck., glumis magis distantibus, a *C. patente*, Hochst., glumis fere muticis; huic fortasse affinior.

Africa tropicalis: Nubia (*Kotschy* n. 53, *hh. Kew, Mus. Brit.*); Abyssinia (*Schimper* n. 821, *hh. Kew, Mus. Brit.*); Senegambia (*h. Kew* n. 331).

Ins. Socotra (*Schweinfurth* n. 592, *h. Balfour propr.*; *Balfour* n. 467 bis, *h. propr.*).

Var. γ. *punctata* (sp. Roxb.! h. propr., Fl. Ind. i. p. 193, tab. Pluk. excl., non Roxb. Ic. ined. in h. Kew); spiculis paullo laxius spicatis, staminibus 2.—*Kunth*, *Enum.* ii. p. 4, *syn. excl.*

C. pumilus, *Benth.*! *Fl. Austral.* vii. p. 258.
Cyperus, sp., *Wall. List* n. 3312 litt. A, H; litt. B, C, E, partim.

C. punctatus, Roxb. Ic. ined. in h. Kew mihi species ignota est; nisi (ut vereor) e duabus speciebus composita fuerit.

India (*Roxburgh*, *h. Kew*; *Wallich* n. 3312 A, *h. Linn. Soc.*); Monghyr (*Buchanan-Hamilton*, *Wallich* n. 3312 E, partim, *h. Linn. Soc.*); Bengal (*J. D. Hooker*, *h. Kew*); Rangoon (*Wallich* n. 3312 H, *hh. Linn. Soc.*, *Mus. Brit.*, *Calcutta*; *R. Scott*, *h. Calcutta*); Tenasserim (*Helfer*, *h. Kew* n. 6209/2); Malaya (*Kunstler* n. 62, *h. Calcutta*)

Australia tropicalis: Rockhampton (*O'Shaughnessy*, *h. Kew*); Portus Denison (*Fitzalan*, *h. Kew*).

12. C. HYALINUS (*Vahl*, *Enum.* ii. p. 329); umbella simplice; spiculis spicatis, admodum compressis, oblongis, pallidis; glumis mucronatis, in unoquoque latere lato conspicue 2–3-costatis; staminibus 2; nuce late ellipsoidea, obtusa, cum $\frac{1}{2}$ parte glumæ æquilonga.—*Kunth*, *Enum.* ii. p. 3; *Boeck.*! *in Linnæa*, xxxv. p. 482.

C. pumilus, *Nees*! *in Wight Contrib.* p. 74, *syn. omn. excl.*; *Kunth*, *Enum.* ii. p. 4, *pro majore parte*; *Steud. Syn.* p. 3 *partim*, *non Linn.*
C. strictus, *Wight*! *h. propr.*, *non Roxb.*
Pycreus pumilus, *Nees in Linnæa*, ix. p. 283.
Cyperus, *Wall.*! *List* n. 3336 partim.

Annua, glabra, radicibus tenuiter fibrosis. Culmi 5–28 cm., sursum trigoni, leves. Folia 2–4, cum culmo sæpe æquilonga, lata 5 mm., levia, flaccida. Bracteæ 5–6, longæ 5–16 cm., latiusculæ, foliis similes. Umbella 5–8-radiata; radii 0–1 dm. longi; ochreæ longæ 15 mm., truncatæ. Spicæ longæ 0–15 mm., 5–20-spiculosæ, ebracteatæ; rhachis 4-alata. Spiculæ rectangulatim patulæ, longæ 9 mm., latæ 4 mm., 8-floræ; rhachillæ alæ perangustæ, persistentes; glumæ 2 imæ parvulæ, quadratæ. Glumæ imbricatæ, paullo distantes, naviculares, summopere compressæ; carina (cum 3–5 nervis adjectis) viridis, excurrens, sursum (in exemplis explanatis) serrulato-scabra; latera lucide alba, a cellulis laxis læte reticulata, a nervis conspicue striata. Antheræ lineari-oblongæ, muticæ, luteæ. Stylus nuce multo brevior; rami

2, e gluma plane exserti. Nux rhachi parallele compressa, quam *C. pumili* 6-plo gravior, castaneo-brunnea; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, inconspicuæ.—Species a *C. pumilo* plane discreta, cum hoc a Bentham Fl. Austr. vii. p. 258 conjuncta; Bentham autem *C. hyalinum* verum non viderat.

Madras Peninsula, rara: Monampatta in oryzeto (*Wight in Wallich*, n. 3336, litt. C partim, *h. Linn. Soc.*) (*Wight* n. 1808, *hh. propr.*, *Mus. Brit.*; *Wight* n. 2864, *h. Calcutta*); sine habitat. (h. Linn. propr., sine nota Linnæi, cum nota lectoris "an *Cyperus pumilus* umbella composita partialis paniculata medium inter *Haspan* et *pumilum*").

13. C. GLOBOSUS (*Allioni, Fl. Pedem. Auctuarium*, p. 49); umbella composita, umbellulis congestis aut simplice pauciradiata; spiculis breviter spicatis, multifloris, linearibus, compressis; glumis spissis, ovatis, obtusis; staminibus 2; nuce ellipsoidea, apicata, cum ½ parte glumæ fere æquilonga.—*Roem. et Sch. Syst.* i. p. 170 (quoad formam typicam), *Mant.* iii. p. 542 *partim*; *Bertol. Fl. Ital.* i. p. 256; *Reichb. Iconogr.* t. 229, *Fl. Germ.* t. 279; *Boiss. Voy. Esp.* ii. p. 626; *Fl. Orient.* v. p. 364; *Gren. et Godr. Fl. Franç.* iii. p. 362; *Parl. Fl. Ital.* ii. p. 24; *Boeck. in Linnæa*, xxxv. p. 458 (*non Boeck. in Flora*, 1879, p. 546); *Benth. Fl. Austral.* vii. p. 260.

C. confertus, *Lam. Ill.* i. p. 145.
C. divaricatus, *Lam. Ill.* i. p. 145.
C. flavidus, *Vahl, Enum.* ii. p. 334, *syn. Retz. excl.*; *Decaisne in Nouv. Ann. Mus. d'Hist. Nat.* iii. p. 359, *nec Retz., nec Roxb.*
C. curvatus, *Vahl, Enum.* ii. p. 338.
C. conglomeratus, *Vahl, Enum.* ii. p. 339, *non Rottb.*
C. Lamarckianus, *Roem. et Sch. Syst. Mant.* ii. p. 108; *Kunth, Enum.* ii. p. 9.
C. capillaris, *Koen.*; *Roxb. Fl. Ind.* i. p. 194; *Nees in Wight Contrib.* p. 76; *Dalz. and Gibs. Bomb. Fl.* p. 283.
C. fascicularis, *Lam. et DC. Fl. Franç.* iii. p. 722, *nec Rottb., nec Desf.*
C. lanceolatus, *Presl in Rel. Haenk.* i. p. 167, *non Poir.*
C. vulgaris, *Sieber*; *Kunth, Enum.* ii. p. 4; *Hassk. Pl. Jav. Rar.* p. 71; *Led. Fl. Ross.* i. p. 239; *F. Muell. Fragm. Phyt. Austral.* viii. p. 260; *Benth. Fl. Hongk.* p. 385, *non Hochst.*
C. mucronatus, *Steud. in Zoll. Verz. Ind. Archip.* ii. p. 62, n. 1608, *non Rottb.*
C. teretifructus, *Steud. in Zoll. Verz. Ind. Archip.* ii. p. 62; *Cyp.* p. 3.
C. jungendus *et* C. trachyrhachis, *Steud. Cyp.* p. 3.

C. flavescens, *Thwaites*! *Enum. Pl. Zeyl.* p. 342; *Benth.*! *Fl. Austral.* vii. p. 260, *syn. excl., non Linn.*
C. Eragrostis *et* C. lucidus, *Rottler*! *in h. propr.*
Pycreus capillaris, *Nees in Linnæa,* ix. p. 283.
Cyperus, *Wall.*! *List* n. 3318 litt. B, D; litt. A, C, partim.

Glabra, annua, radice fibrosa. Culmi 1–9 dm., subtrigoni, leves. Folia 2–3, cum ⅔ parte culmi subæquilonga, angusta, levia. Bracteæ 2–4, usque ad 15 cm. longæ, vix scabræ, foliis similes. Umbella 1–5-radiata; radii 0–7 cm. longi; ochreæ 5–10 mm., truncatæ. Umbellulæ 2–12 cm. longæ, 10–50-spiculosæ, ebracteatæ, congestim corymbosæ, radiolis 0–2 mm. longis, paucispiculosis aut e spica simplice constantes. Spiculæ undique patulæ, longæ 18 mm., latæ 3 mm., 30–40-floræ, pallidæ, stramineo-brunneæ aut nigro-castaneæ; rhachilla subtetragona, alis angustis, persistentibus, rubro maculatis; glumæ 2 imæ parvulæ, bracteæformes. Glumæ florigeræ longæ 2 mm., naviculares, in dorso 3–5-nerviæ, virides, rarius pallidæ, in marginibus hyalinæ. Filamenta persistentia, squamoso-scabra; antheræ oblongæ, muticæ, rubro-maculatæ. Nux compressa, nigro-castanea; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, paullo saccatæ, non porosæ.

Ab Europa australi (varr. incl.) usque ad Japoniam, Malayam, Australiam.

Europa: Alpes maritimæ (*Reichenbach* n. 2309, *h. Kew*); Murcia (*Bourgeau* n. 1540, *hh. Kew, Calcutta*).
Ins. Mascarene (*Macgregor, h. Mus. Brit.*).
Mauritius (*Sieber, Fl. Maurit.* ii. n. 14, *hh. Kew, Mus. Brit.*).
Iberia (*Wilhelms, h. Calcutta*).
India, usque ad 2000 metr. alt.: Cabul (*Griffith, Kew* n. 6190); Nachar (*Stoliczka, h. Calcutta*); Himalaya boreali-occidentalis (*T. Thomson, Brandis, &c.*).
China: Macao (*Vachell, h. Kew*); Shanghai (*Maingay* n. 637, *h. Calcutta*).
Ins. Formosa (*Siebold, h. Kew*).
Japan (*Siebold, h. Kew*).
Australia: New South Wales (*Woolls, h. Kew.*); Victoria, Flum. Upper Hume (*F. Mueller, h. Kew*).
Ins. Nicobars (*Kurz,* h.! *Calcutta*).

Forma *khasiana*; spiculis admodum compressis, longis 22 mm. latis 2½ mm., 40 floris; glumis nitidis ferrugineis aut atris, in carina viridescentibus.

Khasia colles, alt. 1000–1500 metr. (*Griffith, h. Kew* 6191; *C. B. Clarke* nn. 5425, 5758, 17479, 18475, &c.).

Forma *cinnamomea*; spiculis minus compressis, sublanceolatis, longis 24 mm., latis 3 mm., 40–50-floris; glumis concoloribus, cinnamomeo-brunneis, in carina vix viridescentibus.

Assam (*Mann* n. 372, *h. Calcutta*).

Var. β. *Nilagirica* (Hochst.! Steud. Cyp. p. 2, sp.); spiculis admodum compressis, quam in *C. globoso* typico paullo angustioribus; glumis admodum spissis, in dorso viridibus, in lateribus atris, castaneis, ferrugineis aut pallidioribus.—*Boeck. in Linnæa*, xxxv. p. 457.

C. lividus (sp.), *Heyne! MS.*
C. atroferrugineus, *Steud.! Cyp.* p. 2.
C. Junghuhnii, *Miq.! Fl. Ind. Bat.* iii. p. 260.
C. ater, *Dalz. and Gibs.! Bomb. Fl.* p. 283, *non Vahl.*
Cyperus, *Wall.! List* n. 3318, A.
Cyperus, *Wall.! List* n. 3310 [C. semiteres, *Heyne*].

Africa Australis (*Burchell* n. 2081, *h. Kew*).
Zeylania (*Gardner* nn. 954, 955, *h. Kew*; *Thwaites, C. P.* n. 801, *h. Calcutta*).
Montes Nilagirici (*Hochstetter* nn. 945, 945 *a*, *h. Kew*; *Wight* n. 2875, *h. Calcutta*; *C. B. Clarke* n. 10890 &c.).
Bombay: Hewra (*Dalzell, h. Calcutta*).
Montes Kurg (*G. Thomson, h. Calcutta*).
Java: Tugu, alt. 3300 metr. prope Buitenzorg (*Kurz, h. Calcutta*).
Amurland: Kengka Lacus (*Maack, h. Kew*).
China borealis: Shantung (*Maingay* n. 152, *h. Calcutta*).

Var. γ. *stricta* (sp. Roxb.! Fl. Ind. i. p. 200); caule stricto; umbellæ radiis sæpe paullo elongatis; spiculis minus compressis, quam *C. globosi* typici paullo angustioribus, haud raro paucifloris; glumis obscure inflatis, pallide aut fusce stramineis.—*Kunth, Enum.* ii. p. 12 (an *Lam. Ill.* i. p. 146?).

C. tortuosus (*sp. Roxb.! Fl. Ind.* i. p. 197); *Nees in Wight Contrib.* p. 75; *Kunth, Enum.* ii. p. 16 (*non Wall. List* n. 3339).
C. complanatus, *Presl in Oken Isis*, 1828, p. 270; *Steud. Cyp.* p. 3. *partim*; *Franch. et Savat. Fl. Jap.* ii. p. 100.
Cyperus, *Wall.! List* n. 3318, E, C partim.
Cyperus, *Wall.! List* n. 3312, G.
Cyperus, *Wall.! List* n. 3319, B partim.

Punjab (*Stewart* nn. 293, 796, *h. Calcutta*).

Nepaul (*Wallich* n. 3385, *h. Calcutta*).
Bhotan, alt. 1000 metr. (*Gamble* n. 9598, *h. Calcutta*).
Assam (*Griffith* n. 1022, *h. Calcutta*).
Chota Nagpore (*Wood*, *h. Calcutta*).
Madras (*Wight in Wallich* n. 3318 B, *h. Calcutta*; *Wight* n. 2878, *h. Calcutta*).

Forma *tortuosa*; spicularum rhachilla sæpe torta.
Cabul (*Griffith* n. 31, *h. Kew*).
Persia: Susiana (*Haussknecht*, *h. Mus. Brit.*).
Ile de France (*Roxburgh*, *h. Mus. Brit.*; *Balfour*, *h. Kew*).

Of this most interesting species, the above list of localities and of varieties and forms is poor and unfinished; because, when I wrote out the varieties in England, I accepted Boeckeler's view that the colour was the most important character, and I therefore put the black Khasi form (which is just as black sometimes as the Nilgherry one) with the var. (sp. Boeck.) *nilagirica*, as Boeckeler himself has done.

But a longer consideration of the splendid series of material in the Calcutta Herbarium has convinced me that the Khasi black variety is as distinct from the Nilgherry black variety as is any form collected under the name *globosus*; and I should now arrange the varieties in two main series, one, *globosus* proper, extending from the Mediterranean through Central Asia, North India, to China and Japan; the other, *strictus*, with narrower spikelets, in Java, South India, Persia, South Africa. The difference between *C. strictus* and *C. nilagiricus* is wholly one of colour. *C. globosus*, in both its varieties, exhibits every variety of colour, from pale straw through ruddy-brown to black, but not the purple-red tinge so common in *Cyperus*. It is very hard to say what is the essential character of the species: in most forms, the exactly parallel sides of the spikelet and very regularly-arranged glumes are characteristic, but in the beautiful form *cinnamomea* (Mann, n. 372) this fails us. It is difficult to say how *C. lanceus* and *C. atronitens* differ, or to show that they differ as much from *C. globosus* as the admitted forms of *C. globosus* differ between themselves.

Many of our "species" of *Cyperus*, as *C. atronitens*, are founded on specimens all collected within one small area, which are exactly similar *inter se*, and form a sharply-defined species. By comparing a set of these with some one local form of *C. globosus*, we are irresistibly led to the suspicion that further collections in other areas may lead us to regard *C. atronitens* &c. as varieties.

Besides the "forms" mentioned above, a plant, Maingay n. 637, collected at Shanghai, with the glumes green and chestnut-brown, has exactly the external aspect of *C. Eragrostis*; but, on cutting up, is found to be unmistakably *C. globosus*.

C. complanatus, Steud. Cyp. p. 3, is an amalgam of *C. complanatus*, Presl, with Kotschy n. 358, which is *C. rotundus*, Linn. (mihi), and is *C. stoloniferus*, var. *pallida*, Boeck.

14. C. POLYSTACHYUS (*Rottb. Descr. et Ic.* p. 39, t. 11. fig. 1, nuce et pistillo excl.); umbella composita, specie sæpe simplice aut capitata; spiculis fasciculatis aut spicatis, numerosis, multifloris, compressis, anguste oblongis, pallidis, fuscis aut rubescentibus; glumis spissis, ovatis, vix acutis; nuce oblonga, basi conica, apice truncata, compressa faciebus convexis.—*Vahl, Enum.* ii. p. 315; *Roem. et Sch. Syst.* ii. p. 175; *Roxb. Fl. Ind.* i. p. 193; *Nees in Wight Contrib.* p. 75; *Kunth, Enum.* ii. p. 13; *Hook. Niger Fl.* p. 549; *Meyer, Prim. Esseq.* p. 27; *Hassk. Pl. Jav. Rar.* p. 74; *Dalz. and Gibs. Bomb. Fl.* p. 281; *Bertol. Fl. Ital.* i. p. 257; *Guss. Pl. Ins. Inarime*, p. 347; *Parl. Fl. Ital.* ii. p. 25; *Miq. Fl. Ind. Bat.* iii. p. 258; *F. Muell. Fragm. Phyt. Austral.* viii. p. 265; *Benth. Fl. Hongk.* p. 385, *Fl. Austral.* vii. p. 261; *Boeck. in Linnæa*, xxxv. p. 477; *Boiss. Fl. Orient.* v. p. 365; *Coss. Expl. Algér., Bot.* iii. p. 253.

C. fascicularis, *Lam. Ill.* i. p. 144, t. 38. fig. 2; *Desf.*! *Fl. Atl.* i. p. 44.
C. cæspitosus, *Poir. Encyc.* vii. p. 250; *Kunth, Enum.* ii. p. 109; *Hook. et Arn.*! *Bot. Beechey Voy.* p. 99.
C. subulatus, *R. Br. Prodr.* p. 217.
C. brizæus, *Presl, Rel. Haenk.* i. p. 168, *non Rich.*
C. Sonderi, *Schmidt, Fl. Ins. Vir.* p. 162; *Steud. Cyp.* p. 8.
C. strigosus, *Wight*! *h. propr.* n. 1811, *non Linn.*
C. corymbosus, *Roxb.*! *in h. propr. et Ic. ined. in h. Kew, non Rottb.*
C. paniculatus, *Hook. et Arn. Bot. Beechey Voy.* p. 99, *vix Rottb.*
C. polystachyus, var. δ. ferruginea, *Boeck.*! *in Flora*, 1879, p. 548 (*non Boeck. in Linnæa*, xxxv. p. 479).
Pycreus polystachyus, *Beauv. Fl. d'Owar.* ii. p. 48, t. 86. fig. 2; *Nees in Linnæa*, ix. p. 283.
Cyperus, *Wall.*! *List* n. 3340.
Cyperus, *Wall.*! *List* n. 3333.
Cyperus, *Wall.*! *List* n. 3320 litt. A partim.
Cyperus, *Wall.*! *List* n. 3332 litt. B partim.

Glabra, cæspitosa, radicibus fibrosis; aut interdum (in forma typica) umbella capitata; rhizoma horizontale, lignosum, nigrum, tenue. Culmi 3–8 dm. (interdum in arena maritima subnulli), sursum trigoni, leves. Folia 3–7, culmum superantia aut hoc multo breviora, linearia, basi paullo dilatata, vix scabra. Bracteæ 3–8, usque ad 2–4 dm. longæ, patentes, foliis similes. Umbella (in forma typica) specie simplex aut sæpe capitata; radii 1–7, longi 0–3 cm.; ochreæ truncatæ, unidentatæ. Spiculæ in unoquoque radio 10–40, erectæ, fastigiatæ (in var. laxius spicatæ) 20–50-floræ, longæ 2 cm., latæ 2 mm.; rhachillæ alæ angustæ persistentes, juxta basin glumæ dilatatæ; gluma ima minuta, lanceolata, bracteæformis. Glumæ imbricatæ, carinatæ, in dorso viridi-3–5-nerviæ, in lateribus nec nervosæ nec nitidæ. Stamina 2; filamenta parum dilatata, levia vel microscopice parce papillosa; antheræ oblongæ, muticæ, luteæ, sæpe rubro-maculatæ. Stylus cum nuce subæquilongus; rami 2 e gluma longiuscule exserti. Nux cum ½ parte glumæ æquilonga, subsymmetrica, apicata, nigra; cellulæ extimæ quadratæ, emarcidæ, persistentes, albidæ, sæpe porosæ.—Umbellula in unoquoque radio revera semper corymbosa; radioli imi ochreolati, breves, 1–3-spiculosi aut in varietatibus multispiculosi; spica terminalis, multispiculosa.

In totâ orbe terrarum, in tropicis et subtropicis, præsertim in insulis et maritimis vulgaris (varr. θ, ι in Americam borealem temperatam longe prolatis).

Europa: Ins. Ischia (*Hubbard, h. Kew*).

Africa: Algeria (*Lefranc* n. 487, *hh. Kew, Mus. Brit.*); Flum. Nun (*Mann* n. 530, *h. Kew*); Africa Centralis (*Schweinfurth* n. 1152, *h. Kew*); Djur (*Schweinfurth* n. 1462, *h. Kew*); Congo flum. (*Chr. Smith* nn. 14, 25, *h. Mus. Brit.*); Caput Bonæ Spei (*Burchell* nn. 4433, 7567, 8643, *h. Kew*; *Miller, Poeppe, h. Calcutta*); Natal (*Krauss* n. 213, *h. Kew*); Zanzibar (*Hildebrandt* n. 1069, *hh. Kew, Mus. Brit.*); Madagascar (*Pervillé* n. 477, *h. Kew*); Mauritius (*Sieber* n. 10, *hh. Kew, Mus. Brit.*); Ins. Seychelles (*Pervillé* nn. 90, 484, *h. Kew*); Ins. Rodriguez (*Balfour, h. Mus. Brit.*).

India australis et orientalis: Zeylania (*Thwaites, C. P.* 800, *hh. Kew, Mus. Brit.*); Madras Peninsula (*Wight* n. 1811, *h. Kew*; *Wight in Wallich* n. 3340 B, *h. Calcutta*); Bengal, Khoolna (*C. B. Clarke* n. 21770); Sylhet (*J. D. Hooker* *et T. Thomson, h. Kew*); Burma (*Griffith* nn. 6192, 6205, *h. Calcutta*); Mergui (*Griffith, h. Kew* n. 6184); Malacca (*Griffith, h. Kew* n. 6205); Singapore (*Kurz* n. 3013, *h. Calcutta*); Ins. Andaman et Ins. Nicobar (*Kurz, h. Calcutta*).

China: Shantung (*Maingay* n. 155, *h. Kew*); Whampoa (*Hance* n. 1230, *h. Kew*); Canton (*Sampson* n. 258, *h. Kew*); Shanghai (*Maingay* n. 638, *h. Calcutta*); Hongkong (*C. Wright* n. 555, *h. Kew*).

Malaya: Java, Buitenzorg (*Kurz* n. 1854, *h. Calcutta*); Borneo (*Motley* n. 67, *h. Kew*; *Beccari* n. 3685, *h. Kew*); Labuan (*Barber* n. 67, *h. Calcutta*).

Australia: Paterson flumen (*R. Brown* n. 5907, *h. Mus. Brit.*); Portus Jackson (*R. Brown* n. 5908, *hh. Mus. Brit., Kew*); Botany Bay (*Sir J. Banks, h. Mus. Brit.*); Queensland (*Am. Dietrich* n. 632, *h. Kew*).

Polynesia: Isle of Pines (*Milne* n. 169, *h. Kew*); Aneiteum (*Macgillivray, h. Mus. Brit.*); Ins. Sandwich (*Beechey, h. Kew*; *Barclay* n. 1211, *h. Mus. Brit.*; *Seemann* n. 2250, *h. Kew*; *Hillebrand* n. 522, *h. Kew*).

America meridionalis et centralis, cum India occidentali: Martinique (*Sieber* n. 13, *h. Kew*); Cuba (*C. Wright* n. 3354, *hh. Kew, Mus. Brit.*); Guadeloupe (*L'Hérminier, h. Mus. Brit.*); S. Vincent (*Guilding* n. 36, *h. Mus. Brit.*); Nicaragua (*Tate* n. 503, *hh. Kew, Mus. Brit.*); Guiana Francorum (*Sagot* nn. 637, 643, *h. Mus. Brit.*); Pernambuco (*Gardner* n. 124, *h. Kew*); Brasil (*Martius* n. 1086, *h. Kew*; *Burchell* nn. 1209, 1210, 1489, 9919, *h. Kew*; *Glocker* nn. 552, 600, *h. Mus. Brit.*; *Swainson, h. Calcutta*); Rio Negro, Barra (*Spruce, h. Calcutta*); Monte Video (*Baile, h. Mus. Brit.*).

Var. β. *laxiflora*, Benth.! Fl. Austral. vii. p. 261; culmis foliisque elongatis, laxis; umbella plane composita, radiis usque ad 1 dm. longis.

C. aquatilis, *F. Muell.! Fragm. Phyt. Austral.* viii. p. 270 (species).
C. subulatus, *Sieber, Agrost.* n. 145, *vix R. Br.*

Australia: Sinus Rockingham (*Dallachy, h. Kew*).
Singapore (*Lobb, h. Kew*).
Zeylania (*Col. Walker, h. Kew*).
Madras australis: Montes Anamallay (*Beddome, h. propr.*).
Malaya (*Kunstler* n. 43, *h. Calcutta*).

Var. γ. *minor*; umbella laxiuscula; spiculis minus compressis, pallidis, fusco-rubro notatis.

C. pilosus, *Baker*! *Fl. Maurit.* p. 413, *non Vahl.*

An C. minor, *Steud. Cyp.* p. 4?

Mauritius (*Grey*, *h. Kew*; *Bouton*, *h. Kew*).

Var. δ. *ferruginea*, Boeck. in Linnæa, xxxv. p. 479; umbella laxiore sæpius plane composita; spiculis rubescentibus aut subcastaneis, staminibus 2 vel 3.

C. ferrugineus (sp.), *Poir. Encycl.* vii. p. 261; *Kunth, Enum.* ii. p. 11.
C. olivaceus, *Vahl, Enum.* ii. p. 332; *Kunth, Enum.* ii. p. 14.
C. intactus, *Vahl, Enum.* ii. p. 332; *Kunth, Enum.* ii. p. 14.
C. plenus, *Heyne*; *Kunth, Enum.* ii. p. 12.
C. Hookerianus, *Arn.*! *in Wight* n. 2055, *non Thwaites.*
C. Thouarsii, *Kunth, Enum.* ii. p. 12; *Boeck. in Linnæa*, xxxv. p. 481.
C. foliosus, *Kunth, Enum.* ii. p. 11.
C. globosus, *Boeck. in Flora*, 1879, p. 546, *non Allioni.*
C. strictus, *Rottler MS.*; *Heyne partim, non Roxb.*
Cyperus, *Wall.*! *List* n. 3329, K.
Cyperus, *Wall.*! *List* n. 3331.
Cyperus, *Wall.*! *List* n. 3332, litt. B partim.

Africa: Djur (*Schweinfurth* n. 1462, *h. Kew*); Zanzibar (*Hildebrandt* n. 1071, *h. Mus. Brit.*).

Mauritius (*Bouton*, *h. Kew*; *Bojer*, *h. Kew*; *Sieber* n. 5, *hh. Kew, Mus. Brit.*).

Ins. Mascarene (*Macgregor*, *h. Mus. Brit.*).

India: Madras (*G. Thomson* n. 70, *h. Kew*); Zeylania (*Wigh* n. 2055, *h. Kew*; *Thwaites* n. 800, *h. Calcutta*); Pegu (*Kurz* n. 2684, *h. Calcutta*).

Singapore (*Kurz* n. 3012, *h. Calcutta*).

Ins. Andaman (*Kurz*, *h. Calcutta*).

Ins. Nicobar (*Kurz*, *h. Calcutta*).

Ins. Sandwich: Oahu (*Seemann*, *h. Calcutta*; *Hillebrand* n. 564, *h. Kew*).

Var. ε. *micans*; umbella laxa, composita (interdum magna); spiculis majoribus, rubro-brunneis aut luteo-brunneis.

C. micans, *Kunth, Enum.* ii. p. 12 (species).
C. polystachyus, var. ferruginea, *partim, Boeck. in Linnæa*, xxxv. p. 479.

In forma extrema spiculæ laxiuscule spicatæ, longæ 4 cm., latæ 3–4 mm., 40-floræ.

Natal (*Krauss* n. 189, *hh. Kew, Mus. Brit.*; *Buchanan* nn. 103, 111, 319, *h. Kew*; *Sutherland*, *h. Calcutta*; *&c.*).

Zanzibar (*Hildebrandt* n. 1071, *h. Kew*).

Var. ζ. *holosericea*; spiculis pallidis, sæpe paucifloris, quam in var. *filicinâ* angustioribus.

C. holosericeus (sp.), *Link, Hort. Berol.* i. p. 317; *Kunth, Enum.* ii. p. 15.

C. microdontus, *Torrey! in Ann. Lyceum New York*, iii. p. 255; *Bot. U.S. and Mex. Bound. Surv.* p. 226.

C. Gatesii, *Torrey in Ann. Lyceum New York*, iii. p. 255.

C. texensis, *Steud. Cyp.* p. 9.

C. brizæus, *Schweinitz MS., non Rich.*

C. incrassatus, *Beyr. MS.*

C. polystachyus, var. leptostachya, *Boeck. in Linnæa*, xxxv. p. 478.

Spiculæ debiles, laxiuscule spicatæ vel congestæ.—*C. microdontus*, var. *β. texensis* eadem est ac Drummond n. 454.—*C. brizæus*, Schwein., est exemplum parvulum spiculis congestis.—Hæc var. *a C. polystachyo* typ. vix distingui potest.

America borealis subtropica: Florida (*Chapman, h. Calcutta*); New Orleans (*Drummond, h. Calcutta*); Texas (*Drummond* n. 454, *hh. Kew, Mus. Brit., Calcutta*; *Elihu Hall* n. 676, *h. Kew*).

Var. η. *paniculata*; umbella sæpius laxa; spiculis angustis, linearibus, flavidis, castaneis aut rubescentibus.

C. paniculatus (sp.), *Rottb. Descr. et Ic.* p. 40; *Vahl, Enum.* ii. p. 333.

C. scopellatus, *Rich. in Act. Soc. Hist. Nat. Paris*, i. p. 106.

C. olidus, *Vahl, Enum.* ii. p. 333.

C. microdontus, *Sauv. Fl. Cub.* p. 171, *vix Torrey.*

C. fugax, *Liebm.! Mex. Halvgr.* p. 8; *Boeck. in Linnæa*, xxxv. p. 474.

Pycreus Olfersianus, *Nees! in Mart. Brasil., Cyp.* p. 8, *non* Cyperus Olfersianus, *Kunth.*

America tropicalis cum India occidentali: Cuba (*C. Wright, h. Kew*); Mexico (*Liebmann, h. Kew*); Ecuador, Chanduy in litore maris Pacifici (*Spruce* n. 6415, *hh. Kew, Calcutta*); Brasil, Alagoas (*Gardner* n. 1436, *hh. Kew, Mus. Brit.*).

Var. θ. *filicina*; umbella simplice; spiculis (quam *C. polystachyi* typici) paullo latioribus; glumis sæpe luteo-fuscis, subnitidis, haud raro apice mucronatis.

C. filicinus (sp.), *Vahl, Enum.* ii. p. 332; *Kunth, Enum.* ii. p. 14.

C. cæspitosus, *Torrey, Cat. Pl. New York*, p. 89; *Spreng. Syst.* i. p. 224, *non Poir.*

C. Torreyanus, *Roem. et Sch. Syst. Mant.* ii. p. 101.

C. Nuttallii, *Eddy in Spreng. Neue Entd.* i. p. 240; *Torrey in Ann. Lyceum New York*, iii. p. 252; *Fl. New York*, ii. p. 339, t. 135.

C. brizæus, *Pursh. Fl. Amer. Sept.* i. p. 51, *nec Rich., nec Schwein.*

C. Louisianæ, *Steud. Cyp.* p. 10 (ex descr.).
C. polystachyus, var. macrostachya, *Boeck. in Linnæa,* xxxv. p. 479.
Torreya cæspitosa, *Rafin. in Journ. de Phys.* lxxxix. p. 105 (*fide Kunth*).

America borealis: Canada (*Goldie, h. Calcutta*); New Jersey (*Torrey* n. 69, *h. Kew*; *Asa Gray, h. Calcutta*); Virginia (*Greville, h. Calcutta*); Florida (*Chapman, h. Kew*; *Curtiss* n. 3050, *h. Mus. Brit.*); New Orleans (*Drummond* n. 3816, *hh. Kew, Mus. Brit.*); Mexico (*F. Müller* n. 2155, *h. Kew*). Ins. Bahama (*Brace* n. 493, *h. Kew*).

This var. (of which I suppose var. ι. *Cleaverii* is merely a starved form) may perhaps advantageously be treated as a species: it has always a simple umbel, whereas in other varieties and examples of *C. polystachyus* the umbellules appear to me really with divided axes.

Var. ι. *Cleaverii*: culmis unicam spiculam, ei *C. filicini* similem, proferentibus.

C. Cleaverii (sp.), *Torrey! in Ann. Lyceum New York,* iii. p. 258 in notâ; *Steud. Cyp.* p. 13.
C. minimus?, *Nutt. Gen.* i. p. 35, *non Thunb.*
C. tenellus, *Torrey in Ann. Lyceum New York,* iii. p. 257, *non Linn.*

New Jersey (*Cleaver, h. Carey in h. Kew*).

15. C. SULCINUX; umbella simplice; spiculis breviter spicatis aut fasciculatis, multifloris, compressis, linearibus, pallidis; glumis ovatis, obtusis; nuce oblonga, compressa, faciebus concavis.

Annua, tenuior. Culmi 5–40 cm., apice trigoni, leves. Folia 2–3, perangusta, cum culmo æquilonga aut sæpius multo breviora, levia. Bracteæ 3–8, angustæ, modo 12 cm. longæ, umbellam longe superantes, modo umbella breviores. Radii 3–8 usque ad 1 dm. longi, graciles, aut umbella parvula subcapitata; ochreæ usque ad 1 cm. longæ, angustæ, subtruncatæ. Spiculæ in unoquoque radio 6–12, longæ 1–3 cm., latæ vix 2 mm., 10–50-floræ, erectæ aut patulæ; rhachilla vix alata; gluma ima minuta, bracteæformis. Glumæ subremote imbricatæ, in dorso carinatæ, 3–5-nerviæ, fuscæ, in lateribus enervosæ, pallidæ aut obscure rubro-notatæ Stamina 2; antheræ lineari-oblongæ, muticæ, flavæ, apice rubro. Stylus brevis; rami 2, breves, e gluma parum exserti. Nux $\frac{1}{2}$ partem glumæ paullo superans, apice truncata brevissime apicata, in utraque facie sulcato-concava, subsymmetrica aut in margine axin versus spectante obliqua, interdum sulcata; nigra, cellulæ extimæ quadratæ, emarcidæ, albidæ non conspicuæ.

Bengalia borealis et orientalis, alt. 0–1000 metr., frequens (*C. B. Clarke* nn. 17295, 24860, 26479, 27072, 27081, 27156, &c.; *Kurz, h. Calcutta*).

Assam (*Griffith* n. 1601, *h. Kew*).

Pegu (*Kurz* n. 659, *h. Calcutta*; *Eng. Oates, h. Calcutta*).

Tenasserim (*Helfer, h. Kew* n. 6209/4).

Madras australis, Montes Anamallay, alt. 1000 metr. (*Beddome, h. propr.*).

Borneo borealis (*Burbidge, hh. Kew, Mus. Brit.*).

Ins. Philippine (*Moseley, h. Kew*).

16. C. ERAGROSTIS (*Vahl, Enum.* ii. p. 322); umbella specie simplice, pauciradiata, contracta; spiculis fasciculatis, lineari-oblongis, compressis, subturgidis; glumis ovatis, obtusis, in lateribus rubescentibus; nuce cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, obovoidea, crassiuscula.—*Kunth, Enum.* ii. p. 7; *Benth.*! *Fl. Hongk.* p. 385; *Miq. Fl. Ind. Bat.* iii. p. 256; *F. Muell. Fragm. Phyt. Austral.* viii. p. 260; *Boeck. in Linnæa*, xxxv. p. 443 (varr. β partim, ε excl.).

C. cruentus, *Retz. Obs.* v. p. 13; *Roxb. Fl. Ind.* i. p. 196, *non Rottb.*

C. nitidus, *Lam. Ill.* i. p. 145, *non Boeck.*

C. albidus, *Lam. Ill.* i. p. 146.

C. sanguinolentus, *Vahl, Enum.* ii. p. 351; *Nees in Wight Contrib.* p. 75; *Thwaites, Enum. Pl. Zeyl.* p. 342; *Herb. Ind. or., Hook. f. et T. Thoms.* n. 43.

C. ater, *Vahl, Enum.* ii. p. 335; *Kunth, Enum.* ii. p. 7, *non Dalz. and Gibs.*

C. areolatus, *R. Br. Prod.* p. 216.

C. erythræus, *Roem. et Sch. Syst. Mant.* ii. p. 477.

C. pumilus, *Rottb. Descr. et Ic.* p. 29, t. 9. fig. 4, *non Linn.*

C. flavescens, β. rubro-marginatus, *Schrenk*! *Enum. Pl. Nov.* i. p. 3; *Led. Fl. Ross.* i. p. 239.

C. atratus, *Steud. in Zoll. Verz. Ind. Archip.* p. 62, *Cyp.* p. 12; *Miq. Fl. Ind. Bat.* iii. p. 259; *Boeck.*! *in Linnæa*, xxxv. p. 446.

C. concolor, *Steud.*! *Cyp.* p. 6.

C. melanocephalus, *Miq. Fl. Ind. Bat.* iii. p. 259, *e descr.*

C. grossarius, *Koenig*; *Heyne MS. in h. propr.*

Cyperus, *Wall.*! *List* n. 3335.

Cyperus, *Wall.*! *List* n. 3319, A, B partim, C, D, E, F, G, H.

Cyperus, *Wall.*! *Cyp. Indet.* n. 265, *h. propr.*

Cyperus, n. 15, *Herb. Ind. or., Hook. f. et T. Thoms.*

Annua. Culmi basi decumbentes, radicantes, sæpe divisi, non lignosi, 1–5 dm. longi, apice trigoni, leves; vaginæ foliorum longæ, sæpe more *C. Mundtii*, $\frac{1}{3}$ partem culmi integentes. Folia 3–6, cum culmo subæquilonga aut breviora, linearia basi paullum dilatata, in marginibus minutissime scabra. Bracteæ 2–5, usque ad 5–15 cm. longæ, divaricatæ, foliis similes. Umbellæ radii 3–9, sæpius pauci, usque ad 5–8 cm. longi, sæpius multo breviores aut subnulli; ochreæ cylindricæ, inconspicuæ, subbidentatæ. Umbellulæ obscurius compositæ, congestim corymbosæ, ebracteolatæ, radiolis imis brevissimis, paucispiculosis aut e spica simplice constantes. Spiculæ in unoquoque radio 3–12, longæ 8–25 mm., latæ 4 mm., 6–24-floræ; rhachilla fere exalata; gluma ima parvula, triangulari-lanceolata. Glumæ compressæ, vix naviculares, marginibus imbricatis aut (in sicco) subliberis, in dorso virides, sub-3-nerviæ, in lateribus rubescentes aut rubro-brunneæ nec flavescentes. Stamina 3, rarius 2; filamenta squamoso-scabra, persistentia; anthera lineari-oblonga, mutica, flavida. Stylus nuce longior, rami 2, cum stylo subæquilongi, e gluma exserti. Nux lata, subtumida, obtusa, apicata, nigro-fusca; cellulæ extimæ quadratæ, emarcidæ, albidæ, detergibiles.—In forma depauperata, culmi 3–1-spiculigeri, bractea erecta quasi culmum producente.

Asia australi-orientalis, alt. 0–3000 metr., præsertim in montanis communis; usque ad Amurland, Lacum Alakul, Abyssiniam et Australiam extensa.

Lacus Alakul (*Schrenk, h. Kew*).

Baltisthan, alt. 2500 metr. (*C. B. Clarke* n. 30021, *h. Kew*).

India: Sikkim, Lachoong, alt. 3000 metr. (*J. D. Hooker, h. Kew*); Punjab (*Jacquemont* nn. 432, 437, *h. Kew*); Cabul (*Griffith* n. 6188 partim, *h. Kew*; n. 6188, *h. Calcutta*); Kumaon (*Strachey et Winterbottom* n. 5, *h. Kew*); Nepaul (*Wallich* n. 3319 H, *h. Calcutta*); Himalayas Orientalis (*Griffith* nn. 6187, 6201, *hh. Kew, Calcutta*); Khasia, alt. 1200 metr. (*C. B. Clarke* n. 5349); Bengal, Sahebgunj (*Kurz, in h. Calcutta*); Mons Aboo (*King, h. Calcutta*); Montes nilagirici (*Hohenacker* n. 946, *h. Kew*; n. 946 partim, *h. Mus. Brit.*); Zeylania (*Thwaites, C. P.* n. 802, *hh. Kew, Calcutta*); Chittagong (*J. D. Hooker et T. Thomson* n. 57, *h. Kew*).

Burma: Ava (*Wallich* n. 3335, *hh. Kew, Linn. Soc., Calcutta*); Pegu (*Kurz* n. 654, *h. Calcutta*); Tavoy (*Wallich, h. Kew*).

Java: Buitenzorg (*Kurz, h. Calcutta*).

China: Hongkong (*Wilford* n. 312, *h. Kew*); Kianang (*Sir

G. Staunton, h. Mus. Brit.); Amoy (*Hance* n. 1387, *h. Kew*); Formosa (*Oldham* n. 586, *hh. Kew, Mus. Brit.*); Shantung (*Maingay* n. 156, *h. Calcutta*).

Japan (*Oldham* n. 902, *h. Kew*).

Australia: Portus Jackson (*R. Brown* n. 5896, *h. Mus. Brit.*).

Ins. S. Helena (*Burchell* n. 7, *h. Kew*, an a navibus Anglicanis ab India allata?).

Var. β. *cyrtostachys*; spiculis paullo minoribus, sæpius 6–10-floris, magis fuscis.

C. cyrtostachys (sp.), *Miq. Fl. Ind. Bat.* iii. p. 257.

C. levis, *F. Muell.! in h. propr., non R. Br.*

C. Eragrostis, *Benth.! Fl. Austral.* vii. p. 258.

C. Eragrostis, var. β. microstachya quoad exempla Australica et var. δ. cyrtolepis, *Boeck. in Linnæa*, xxxv. p. 445.

Varietas in formam typicam sensim transeuns; exempla in Peninsula Malaccensi lecta inter *C. Eragrosti* typicum hujusque varietatem cyrtostachidem intermedia sunt.

Java. Borneo (*Motley* n. 989, *h. Kew*).

Australia: Queensland; New South Wales; Richmond Flumen (*C. Moore* n. 151, *h. Kew*); Victoria, Mons Aberdeen et Buffalo Range (*F. Mueller, h. Kew*); Flumm. Mitta Mitta et Hume (*F. Mueller, h. Kew*); South Australia.

Var. γ. *neurotropis*; spiculis interdum (quam in *C. Eragrostis* typico) minoribus; glumis breviter ovatis.

C. neurotropis (sp.), *A. Rich. Fl. Abyss.* ii. p. 476.

C. Eragrostis, var. microstachya, *Boeck. in Linnæa*, xxxv. p. 445, quoad exemplum Africanum.

Nux in n. 765 Schimper parva, albida videtur: sed in omnibus formis *C. Eragrostis* exempla cum nucibus (imperfectis?) minoribus albis interdum obvia sunt.

Abyssinia (*Schimper* n. 1424, *h. Mus. Brit.*): Gapdia (*Schimper* n. 765, *hh. Kew, Mus. Brit.*).

Var. δ. *micronux*; spiculis angustioribus, usque ad 36-floris, concoloribus, cinnamomeo-brunneis; glumis magis spissis, marginibus in medio conspicue rhomboideo-angulatis; stylis longius exsertis, spiculas comosas efficientibus.

C. Eragrostis, var. minor, *Kunth, Enum.* ii. p. 7, *in obs.*

C. jeminicus, *h. Heyne! nec Rottb.*

Cyperus, *Wall.! List* n. 3354, B.

India (*Wallich* n. 3354 B, *hh. Kew, Linn. Soc., Calcutta*); Bengal, Mymensingh (*C. B. Clarke* n. 7957, *h. Calcutta*); Assam, Gowhatty (*Simons, h. Calcutta*).

The nut is perhaps hardly smaller than in *C. Eragrostis* type, but I have written up this name in European herbaria and cannot alter it.

17. C. UNIOLOIDES (*R. Br.*! *Prod.* p. 216); umbella simplice aut subcapitata; spiculis breviter spicatis, magnis, compressis, lanceolatis, pallide brunneis; glumis spissis, carinatis, acutis; nuce cum $\frac{1}{4}$–$\frac{1}{3}$ parte glumæ æquilonga, obovoidea.—*Kunth, Enum.* ii. p. 112; *Benth. Fl. Austral.* vii. p. 260.

C. lanceus, *F. Muell. Fragm. Phyt. Austral.* viii. p. 259, *non Thunb.*

C. luteolus, *Boeck.*! *in Flora*, 1875, p. 82.

Radix fibrosa. Culmi 4–8 dm., sursum trigoni, leves. Folia 2–4, cum $\frac{2}{3}$ parte culmi æquilonga, in marginibus antice spinuloso-scabra. Bracteæ 3–4, longæ (interdum usque ad 3–4 dm.), antice spinuloso-scabræ, foliis similes. Umbellæ radii 1–5, usque ad 5 cm. longi, sæpius breves aut brevissimi; ochreæ 1 cm., angustæ, truncatæ. Spicæ longæ 0–1 cm., ebracteatæ, 4–12-spiculosæ. Spiculæ longæ 8–18 mm., latæ 4–7 mm., 10–22-floræ, a bracteola lineari longa 3–7 mm. interdum suffultæ; rhachilla fere exalata; gluma ima parva, oblonga. Glumæ ovatæ, compressæ, subturgidæ, in dorso viridi-3-nerviæ, in lateribus enervosæ, lucide luteo-brunneæ, leves, in marginibus hyalinæ in sicco crispato-undulatæ. Filamenta 3, persistentia; antheræ lineari-oblongæ, muticæ. Stylus cum nuce æquilongus; rami 2, e gluma breviter exserti. Nux leviter compressa, nigra; cellulæ extimæ quadratæ, emarcidæ, opacæ, albæ, porosæ.

Australia, tropicalis et temperata; varr. in India, Capite Bonæ Spei et America calidiore etiam extensis.

Australia (*R. Brown* n. 5900, *hh. Kew, Mus. Brit.*); Queensland (*Am. Dietrich* n. 612, *h. Mus. Brit.*); Queensland, Brisbane fl. (*F. Mueller, h. Kew*); Victoria, Hume flum. (*F. Mueller, h. Kew*).

Var. *β. angulata*; nuce subobtuse obovoidea, in altero margine interdum subacuta, cellulis extimis late porosis (si mavis nuce albo-reticulata).

C. angulatus (sp.), *Nees*! *in Wight Contrib.* p. 73; *Boeck.*! *in Linnæa*, xxxv. p. 465.

C. spinuliferus, *Boeck.*! *in Linnæa*, xxxv. p. 465.

Pycreus angulatus, *Nees in Linnæa*, ix. p. 283.

Cyperus, *Wall.*! *List* n. 3324 (omnino).

Cyperacea, *Griff. Itin. Notes*, p. 90, n. 1327.

In Wallich n. 3324 A pro maxima parte exempla nimis juvenia sunt spiculis 3–4 mm. latis. In exemplis maturatis spiculæ usque ad 6–7 mm. latæ videntur (exempla numerosa a Khasia et Nepaul). In exemplis nilagiricis, umbella subcongesta, spiculæ fere castaneæ. Nux in omnibus omnino eadem; mihi formæ nec varietates æstimandæ sunt.

India, haud communis: Nepaul (*Wallich* n. 3324 A, *hh. Linn. Soc., Kew, Mus. Brit., Calcutta*); Khasi colles (*Griffith* n. 1327, *h. Kew*; *Kurz* n. 371, *h. Calcutta*); Khasi colles, alt. 1000 metr. (*Hooker f. et T. Thomson, hh. Kew, Calcutta*); Bengal, Dinajpur in lacubus natans (*C. B. Clarke* n. 26442); Montes Nilgiri (*Wight* n. 2875, *h. Kew*; *Wight* n. 2874, *h. Calcutta*; *King, h. Calcutta*); Pycara (*Beddome, h. propr.*).

Burma: Ava (*Wallich* n. 3324 B, *h. Linn. Soc.*).

Var. γ. *capensis*; nuce obovoidea, in utroque margine a linea extrusa brunnea acute carinata, nigra, cellulis extimis albescentibus, obscuris.

C. angulatus, var. capensis, *Boeck. in Linnæa*, xxxv. p. 465.

C. bromoides, *Kunth, Enum.* ii. p. 8 partim.

C. pseudo-bromoides, *Boeck. in Linnæa*, xxxv. p. 464, quoad exempla Drège.

Caput Bonæ Spei (*Drège, h. Kew*, exempla plura); Transkei (*R. Baur* n. 371, *h. Kew*).

Var. δ. *bromoides* (sp.), Link, Jahrb. iii. p. 85; nuce cum ¼ parte glumæ vix æquilonga, apice subconoidea, marginibus obtusis, cellulis extimis albis, opacis, obscure scabridis, nec porosis nec reticulatis.—*Kunth, Enum.* ii. p. 8; *Boeck. in Linnæa*, xxxv. p. 463.

C. pseudo-bromoides, *Boeck. in Linnæa*, xxxv. p. 464, quoad exempla americana.

America meridionalis, cum India occidentali, et Mexico: Mexico (*Berlandier* n. 753, *h. Mus. Brit.*; *Bourgeau* n. 2731 partim, *h. Kew*); Cuba (*C. Wright* n. 214, *h. Kew*); Guatemala (*Salvin, h. Kew*); Venezuela, Tovar (*Fendler* n. 1590, *h. Kew*); Brasil (*Burchell* n. 8158, *h. Kew*); Paraguay, Villa-Rica (*Balansa* n. 405, *h. Kew*).

‡‡ *Species in Indiâ Orientali nondum repertæ.*

18. C. LEUCOLEPIS (*Carey MS. in h. propr.*); umbella congesta; spiculis 4–6-floris, albescentibus; glumis obtusis, nervo sub apice breviter excurrente, in utroque latere hyalino 2-nervosis.

C. divergens, *Chapm. Fl. South U.S.* p. 512, *non H. B. K.*

C. pumilo similis. Glumæ fere *C. hyalini* sed multo minores. Stamina 3. Nux immatura.

United States: Florida, prope Quincy (*Chapman* n. 7, *in h. Carey in h. Kew*).

19. C. Afzelii (*Boeck. in Linnæa*, xxxv. p. 475); umbella capitata; involucri bracteis 2–1, altero proventu suberecto quasi culmum producente; glumis ovatis, obtusis, stramineis; nuce anguste obovoidea, subtruncata, nigro-castanea, cellulis extimis quadratis.

C. flavescens, *Oliver in Trans. Linn. Soc.* xxix. p. 164, *non Linn.*

C. Afzelii, var. *β. capillifolia*, Boeck. in Flora, 1879, p. 547, e descriptione videtur eadem; hujus autem typus, Schweinfurth n. 2195 in h. Kew est species umbella composita, stylo trifido, &c.

Africa: Sierra Leone (*Afzelius, h. Mus. Brit.*); in regione nilotica superiore Madi (*Grant, h. Kew*); Djur (*Schweinfurth* n. 1948, *h. Kew*).

20. C. Olfersianus (*Kunth, Enum.* ii. p. 10); umbella specie simplice, 1-pauciradiata; spiculis plurifloris, oblongis, subturgidis; glumis ovatis, obtusis, stramineis; nuce late oblonga, utrinque angustata, pallide fusca, cellulis extimis quadratis.—*Boeck. in Linnæa*, xxxv. p. 439; *non* Pycreus Olfersianus, *Nees.*

C. propinquus, *Steud. Cyp.* p. 4.

C. helvus, *Liebm.! Mex. Halfgr.* p. 9.

C. ambiguus, *Liebm.! Mex. Halfgr.* p. 11, *non Steud.*

C. correctus, *Steud. Cyp.* p. 7.

C. Maximiliani, *Schrad.*; *Steud. Cyp.* p. 4.

C. fasciculatus, *Elliot, Bot.* i. p. 63; *Kunth, Enum.* ii. p. 113.

C. variegatus, *Griseb.! Fl. Brit. West Ind.* p. 562; *Sauvalle! Fl. Cub.* p. 171, *non H. B. K.*

C. Elliotianus, *Roem. et Sch. Syst.* ii. *Mant.* p. 100; *Torrey in Ann. Lyceum New York*, iii. p. 254.

Pycreus infirmus, *Nees in Mart. Brasil., Cyp.* p. 8, *fide Boeck.* (sed reperire nequivi).

P. propinquus, *Nees! in Mart. Brasil., Cyp.* p. 7.

P. Maximiliani, *Nees in Mart. Brasil., Cyp.* p. 7.

P. Elliotianus, *Nees in Linnæa*, ix. p. 283.

America: a Mexico et Cuba usque ad Monte Video frequens.

Insulæ Indiæ Occidentalis: Cuba (*Wright* n. 706, *h. Kew*); Jamaica (forma = *C. ambiguus*, Liebm.) (*Purdie, h. Kew*); S. Domingo (*Jacquemont, h. Kew*).

Mexico: Huatusco, alt. 1400 metr. (*Liebmann, h. Kew*; *F. Mueller* n. 1765, *h. Kew*).

Guatemala (forma = *C. ambiguus*, Liebm.) (*G. Bernoulli* nn. 418, 575, *h. Kew*).

Brasil (*Burchell* nn. 2298, 2418, 4374, 6493, *h. Kew*; *Glaziou* n. 6761, *h. Kew*; *Gardner* n. 714, *hh. Kew, Mus. Brit.*; *Glocker* n. 202, *hh. Kew, Mus. Brit.*); Rio Janeiro (*Glaziou* n. 9339, *h. Kew*).

Paraguay (*Balansa* n. 402, *h. Kew*); in ripis fl. Uruguay (*Fox* n. 249, *h. Kew*).

Not easily distinguishable from *C. flavescens*, Linn., unless by the cells of the surface of the nut.

C. Elliottianus, Roem. et Sch., founded on one very poor specimen, is referred (doubtfully) by Nees and Boeckeler to *C. flavescens*; but it is described as having two, not three, bracts; *C. Olfersianus* has often two bracts only, while *C. flavescens* has very rarely less than three.

21. C. BOIVINI (*Boeck. in Linnæa*, xxxv. p. 481); umbellis (in exemplis visis) 3–1-radiatis, subcapitatis; spiculis paucis, fasciculatis, compressis; glumis ovatis, minutissime mucronatis, in lateribus nitidis, purpureis; nuce ellipsoidea, compressa, cellulis extimis quadratis.—*Bojer MS. in h. Kew.*

C. atropurpureus, *Bojer MS. in h. Kew.*

Nux *C. polystachyi*. Stamina 3. Spiculæ purpureo-sanguineæ iis *C. rotundi* similes.

Madagascar (*Blackburn, h. Kew*). Bourbon (*Balfour, h. Kew*).

22. C. MUNDTII (*Kunth, Enum.* ii. p. 17); culmo decumbente aut sarmentoso, a vaginis foliorum alte intecto; umbella simplice aut composita, bracteis breviusculis; spiculis subdigitatis, densifloris, castaneo-rubris aut brunneis; nuce anguste ellipsoidea. —*Boeck. in Linnæa*, xxxv. p. 448, *in Flora*, 1879, p. 545.

C. densifolius, *Steud.*! *Cyp.* p. 6.

C. cruentus, *Baker*! *Fl. Maurit.* p. 408, *non Retz.*

C. reptans, *Bojer*! *MS.*

C. turfosus, *Salzm.*! *MS.*

C. Eragrostis, *Willk. et Lange, Fl. Hisp.* i. p. 138 (?), *non Vahl.*

Pycreus Mundtii, *Nees in Linnæa*, ix. p. 283, x. p. 131.

Species *Cypero Eragrostis*, Vahl, simillima; differt nuce multo angustiore.

Africa, fere tota, cum Madagascar.

Tangier (*Salzmann, hh. Kew, Calcutta*).

Libysche Wüste (*Ascherson* n. 530, *h. Kew*).

Apud rivos White Nile et Gazelle (*Schweinfurth* nn. 1116, 1119, *h. Kew*).

Cape Town (*Rehmann* n. 1779, *h. Mus. Brit.*).

Natal (*Krauss* n. 415, *h. Kew*).

Delagoa Bay (*Forbes, h. Kew*).

Madagascar (*Grey, h. Kew*; *Blackburn, h. Kew*; *Thompson, h. Mus. Brit.*).

Var. *β. distichophylla*; culmis magis elongatis, debilibus, usque ad 24 folia proferentibus.

C. distichophyllus (sp.), *Steud. in Schimper* n. 745, *Cyp.* p. 11; *Boeck. in Linnæa,* xxxv. p. 488.

C. Eragrostis, *A. Rich. Fl. Abyss.* ii. p. 475, *non Vahl.*

Nux omnino *C. Mundtii* typ. Spiculæ modo induratæ (*Schimper* nn. 745, 760), modo tenuiores (*Schimper* n. 344).

Abyssinia (*Schimper* nn. 344, 745, 760, *hh. Kew, Mus. Brit.*).

23. C. GRAMMICUS (*Kunze*; *Kunth, Enum.* ii. p. 6); umbella congesta; glumis remotiusculis, pallide fuscis aut rubescentibus; styli ramis e gluma longiuscule exsertis.—*C. Gay, Hist. Chile,* vi. p. 162, t. 70. fig. 1; *Boeck. in Linnæa,* xxxv. p. 449.

C. gramineus *et* C. parvulus (*Steud. Cyp.* pp. 4, 5).

[Cyperus Ranko, *Steud.*! *Cyp.* p. 315, *est* Isolepis.]

Stamina 2. Nucis cellulæ extimæ quadratæ, porosæ.

Chili: Osorno (*Lechler* n. 264, *h. Kew*); Valdivia flumen (*Bridges* n. 838, *h. Kew*); Antuco (*Poeppig* n. 18, *h. Mus. Brit.*).

24. C. ARGENTINUS; foliis plurimis, culmos longe superantibus; umbella simplice; spiculis spicatis, latiusculis, castaneorubris aut colore eluto fere stramineis; nuce obovoidea, turgida, cellulis extimis quadratis.

Radix fibrosa. Culmi 10–15 cm. Involucri bracteæ 3–4, usque ad 1–2 dm. longæ. Spiculæ longæ 8 mm., latæ 3 mm., multum compressæ, 8–14-floræ. Glumæ obtusæ, in dorso viridi-3–5-nerviæ. Stamina 2. Nux cum $\frac{1}{3}$ parte glumæ subæquilonga.

Respublica Argentina (*Lorentz* n. 1075, *h. Kew*).

It is possible that this is the species described as *C. Lozentzianus* by Boeckeler (in Linnæa, xxxv. p. 357); but the Lorentz number does not agree, nor does the description, satisfactorily.

25. C. LAGUNETTO (*Steud.*! *Cyp.* p. 5); umbellæ radiis 1–3, admodum inæqualibus; spiculis paucis, subspicatis, linearibus,

fusco-castaneis; nuce obovoidea, compressa, cellulis extimis quadratis.

C. melanostachyus, *Palmer in h. Parry* n. 904, *non H. B. K.*

Stamina 2. Nux $\frac{1}{2}$ parte glumæ brevior (non rugulosa), nigra cellulis extimis albidis, sæpe porosis.—Differt a *C. Olfersiano* glumis (castaneis nec luteis) nuce magis obovoidea.

26. C. DIANDRUS (*Torrey in Ann. Lyceum New York,* iii. p. 251, var. β excl.); umbella contracta; spiculis lineari-oblongis, fusco-brunneis; glumis laxiuscule imbricatis; stylo brevi, ramis longissime exsertis; nuce ellipsoidea, compressa.—*Kunth, Enum.* ii. p. 6; *Boeck. in Linnæa,* xxxv. p. 447.

Species a pluribus auctoribus cum *C. rivulari* conjuncta; a quo differt nonnisi "spicis comosis," *i. e.* stylorum ramis e gluma longissime exsertis.

America borealis, in oris occidentalibus: Canada (*Macoun, h. Kew*); New Jersey (*Asa Gray, h. Carey in h. Kew*); Philadelphia (*Torrey,* h. *Kew*); Louisiana (*Torrey, h. Mus. Brit.*).

27. C. RIVULARIS (*Kunth, Enum.* ii. p. 6); umbella simplice; spiculis lineari-oblongis, obtusiusculis, brunneis aut subcastaneis; glumis subrigide chartaceis, ovatis, obtusis; stylo brevi, ramis e gluma breviter exsertis.—*Boeck. in Linnæa,* xxxv. p. 452.

C. diandrus, β. castaneus, *Torrey in Ann. Lyceum New York,* iii. p. 252; *Ser. Watson, Bot. California,* ii. p. 214.

C. flavescens, β. castaneus, *Pursh. Fl. Am. Sept.* i. p. 52.

C. Bigelovii, *Steud. Cyp.* p. 5.

C. flavescens, *Linn.* ! *in h. propr.*; *Boott* ! *MS. in h. Mus. Brit.*

C. tenellus, *Presl, Rel. Haenk.* i. p. 176.

Species cum *C. flavescente* maxime confusa, ab hac ope cellularum extimarum nucis quadratarum æriter internota; a *C. Olfersiano* quoad colorem diversa; hac autem nota in varietatibus elabitur.

America borealis temperata; sat vulgaris: Canada (*Macoun, h. Kew*; *Goldie, h. Calcutta*); Tennessee (*Rugel, h. Mus. Brit.*); S. Louis (*Drummond, h. Kew*); Washington (*Cooley* n. 81, *h. Carey in h. Kew*); California (*fide Sereno Watson*).

Var. β. *eluta*; spiculis majoribus, colore plus minus eluto, interdum fere stramineis.

Pennsylvania (*Moser, h. Kew*; *Walton, h. Calcutta, &c.*).

Var. γ. *depauperata*; culmo 3–1 spiculas proferente.

C. diandrus, var., *Carey, MS. in h. propr.*

Michigan: prope S. Josephi (*h. Carey in h. Kew*).

Var. δ. *acutata*; spiculis lanceolatis subacutis.

Mexico (*Schmitz in h. Auerswald* n. 371, *h. Mus. Brit.*; *Berlandier* n. 371, *h. Mus. Brit.*).

28. C. LANCEUS (*Thunb. Prod.* p. 18; *Fl. Cap.* i. p. 383); stolonibus crassis; umbella specie simplice; spiculis fasciculatis; glumis obtusis, castaneis aut brunneis in carina viridibus; nuce obovoidea, compressa, cum ¼ parte glumæ vix æquilonga.—*Kunth, Enum.* ii. p. 8 (var. β excl.?).

C. melanopus, *Boeck.! in Flora*, 1879, p. 545.

C. nitidus, *Boeck. in Linnæa*, xxxv. p. 461 partim (*i. e.* plantis et syn. Asiaticis excl.), *nec Lam.*

Kunthii var. β. *macrostachyam*, Boeckeler (in Linnæa, xxxv. p. 462), ad suum *C. macranthum* ducit, cujus nux (cellulis extimis oblongis) a nuce *C. lancei* longe distat. Exempla in h. Kew, sub nomine β. *macrostachys*, Kunth, conservata, sunt *C. lanceus*, Thunb.

Africa australis (*Burchell* nn. 55, 676, 6862, *h. Kew*); Uitenhage (*Zeyher* nn. 634, 715, *h. Kew*); Mons Table (*Ecklon* n. 885, *hh. Kew, Mus. Brit.*); Natal (*Krauss* n. 205, *h. Kew*).

Africa centralis: Flumen White Nile (*Schweinfurth* n. 1219, *h. Kew*; *&c.*).

Madagascar (*Parker* n. 12, *h. Kew*; *Baron* n. 832, *h. Kew*).

Var.? β. *Grantii*; glaucescens, involucri bracteis elongatis.

C. nitidus, *Oliver in Trans. Linn. Soc.* xxix. p. 164.

Mihi videtur *C. globoso*, var. *nilagirico* affinior, verisimiliter species nova; sed exemplum nimis juvene; styli rami an sint 2 vel 3 discernere nequivi.

Uniyambène, lat. austral. 6° (*Grant, h. Kew*).

29. C. ATRONITENS (*Hochst. in h. Schimper* n. 312); umbella capitata, pauciradiata vel evoluta composita; glumis brevibus, ovatis, obtusis, atronitentibus in dorso viridibus; nuce ellipsoidea, compressa, cum ⅔ parte glumæ æquilonga.—*A. Rich. Fl. Abyss.* ii. p. 476; *Boeck. in Linnæa*, xxxv. p. 456.

A. melanocephalus, *R. Br.! in Salt Abyss., App.* iv. p. 62, *nomen nudum.*

C. elegantulus, *Steud. in Flora*, 1842, p. 583.

C. ischnocornus, *Steud. Cyp.* p. 11.

Umbella sæpius plus minus contracta; in Schimper n. 505, radii plures, usque ad 6 cm. longi, apice umbellulati, spiculis numerosis.

Africa; late dispersa: Abyssinia (*Schimper* nn. 25, 312, 505, 574, 845, 1245, *hh. Kew, Mus. Brit.*; *Rohr, h. Kew*; *Dillon et Petit, h. Kew*); Fernando Po (*Mann* n. 1470, *h. Kew*); Natal (*Buchanan* nn. 50, 307, *h. Kew*).

30. C. ATRONERVATUS (*Boeck. in Linnæa*, xxxv. p. 358); cum elongato a vaginis foliorum alte intecto; umbella subcapitata; glumis longis, viridibus, per totam fere latitudinem longitudinaliter atronervatis.

Stamina 3.—*Cypero Mundtii* affinis.

Abyssinia (*Schimper* nn. 1244, 1287, *hh. Kew, Mus. Brit.*).

31. C. CHRYSANTHUS (*Boeck. in Linnæa*, xxxv. p. 476); umbella simplice; spiculis breviter spicatis, lineari-oblongis, luteis brunnescentibus; glumis ovatis, sub apice mucronulatis; nuce anguste ellipsoidea, modice compressa, $\frac{1}{2}$ partem glumæ superante, cellulis extimis quadratis.

Africa australis (*Drège, h. Kew*; *h. Harvey* n. 80, *h. Kew*); Natal (*Grant, h. Calcutta*).

C. permutatus, Boeck. in Linnæa, xxxv. p. 476, which is *C. lanceus* γ? *mucronatus*, Kunth, is said by Boeckeler to differ in the minute nut (not one fourth the length of the glume). So far as my memory serves, I believe that I considered it = *C. chrysanthus*; but I have no note of it, and can verify nothing here.

32. C. MELANOSTACHYUS (*H. B. K. Nov. Gen. et Sp.* i. p. 207); umbellæ radiis 1–4, brevibus aut subnullis; glumis ovatis, obtusis, castaneis in dorso viridibus; nuce cum $\frac{1}{2}$ parte glumæ æquilonga, ellipsoidea, subobtusa.—*Kunth, Enum.* ii. p. 10 (planta domingense excl.); *Liebm. Mexic. Halfgr.* pp. 13, 14; *Boeck. in Linnæa*, xxxv. p. 455.

C. variegatus, *H. B. K. Nov. Gen. et Sp.* i. p. 208.

C. adustus, *Presl, Rel. Haenk.* i. p. 167; *Kunth, Enum.* ii. p. 10.

America calidior, alt. 1500–3000 metr.: Mexico (*Coulter* n. 1613, *h. Kew*; *Bourgeau* n. 431, *h. Kew*; *F. Mueller* n. 1985, *h. Kew*); Neo-Granada (*Holton* n. 121, *hh. Kew, Calcutta*); Ecuador (*Spruce* n. 5905, *hh. Kew, Mus. Brit., Calcutta*), prope Quito (*Jameson* n. 270, *h. Kew*); Bolivia, alt. 3100 metr. (*Mandon* n. 1400, *h. Kew*).

33. C. CIMICINUS (*Presl, Rel. Haenk.* i. p. 166); umbella con-

tracta; glumis parvis, ovatis obtusis, nigro-castaneis in carina viridibus; nuce cum $\frac{2}{3}$ parte glumæ æquilonga, ellipsoidea, utrinque angustata.—*Boeck. in Linnæa,* xxxv. p. 454.

A *C. melanostachyo* recedit glumis parvis admodum obtusis: a *C. atronitente* vix (nonnisi patria) differt.

Neo-Granada (*Purdie, h. Kew*); Mexico, in convalle metropolitana (*Schmitz, h. Mus. Brit.*).

34. C. MEGAPOTAMICUS (*Kunth, Enum.* ii. p. 10, syn. excl.); culmis elongatis aut filiformibus, monocephalis; spiculis parvis, lineari-oblongis, fuscis aut subrubescentibus; glumis ovatis obtusis; nuce parvula, ellipsoidea.—*Boeck. in Linnæa,* xxxv. p. 453.

Pycreus megapotamicus, *Nees in Mart. Brasil., Cyp.* p. 6.

Species a *C. Olfersiano* parum remota.

Brasilia (*Sellow, h. Kew*); Pampas (*Tweedie* n. 615, *h. Kew*); Paraguay (*Madon* n. 672, *h. Kew*).

†† Umbella plane composita, umbellularum radiolis plus minus evolutis.

‡ Species in Indiâ Orientali indigenæ.

35. C. PUNCTICULATUS (*Vahl, Enum.* ii. p. 348); umbella composita; involucri bracteis longis, umbellarum partialium subnullis; spiculis majusculis, laxe spicatis, lineari-oblongis, admodum compressis, rubro-stramineis; nuce majuscula, obovoidea, multum compressa.—*Kunth, Enum.* ii. p. 15; *Dalz. and Gibs. Bomb. Fl.* p. 283; *Thwaites, Enum. Pl. Zeyl.* p. 342; *Boeck. in Linnæa,* xxxv. p. 472 (synon. Roxburghianis ex omnibus auctoribus delendis).

C. inundatus, *Nees in Wight Contrib.* p. 76, *non Roxb.*
C. procerus, *Roxb. Fl. Ind.* i. p. 203 partim, *Ic. ined. in h. Calcutta.*
Cyperus (innominatus), *Roxb. Ic. ined.* n. 725 *in h. Kew.*
Cyperus, *Wall.*! *List* n. 3336 A, C partim, D, F.
Cyperus, *Wall.*! *List* n. 3355 B.

Radix fibrosa, annua. Culmus solitarius, 3–8 dm., erectus, basi crassiusculus, sursum triqueter, levis. Folia 3–5, cum culmo sæpe æquilonga, lata 8–10 mm., carinata, levia. Bracteæ 3–5, usque ad 3–4 dm. longæ, patulæ, foliis similes. Umbellæ radii 4–10, longi 5–15 cm.; ochreæ 10–15 mm., truncatæ, 1-dentatæ; umbellæ partiales corymbosim 3–4-radiatæ, bracteis nullis aut minimis; spicæ longæ 3–5 cm., 4–18-spiculosæ, rhachi glabra. Spiculæ longæ 1–2 cm., latæ 4 mm., 7–30-floræ; rhachilla fere exalata; gluma ima parvula, oblonga, bracteæformis. Glumæ leviter imbricatæ, ovatæ, obtusæ, compressæ, in dorso virides sub-3-nerviæ, in lateribus latis enervosæ, lucidæ. Stamina 2 vel 3; antheræ lineari-oblongæ, muticæ, rubræ. Stylus nuce brevior; rami 2, e gluma breviter exserti. Nux cum $\frac{1}{2}$ parte glumæ vix æquilonga, truncata, nigra; cellulæ extimæ emarcidæ, hyalinæ, non porosæ.—*C. inundatus*, Roxb. in Sect. *Juncello*, *C. procerus*, Rottb. in Sect. *Eucypero* ordinati sunt.

India australis: Madras Peninsula (*Wallich* n. 3336 litt. A, D, F, *h. propr.*; *Wight* n. 2871, *h. Calcutta*; *Wight* n. 1813, *h. Kew*).

Zeylania (*Thwaites C. P.* n. 3316, *hh. Kew, Mus. Brit.*; *Thwaites, C. P.* n. 3751, *hh. Calcutta, Mus. Brit.*; *Beckett, h. Kew*).

Var. β. *quinquagintiflora*; spiculis elongatis, usque ad 50-floris; antheris plane apiculatis.

C. macrostachyus, *Vahl, Enum.* ii. p. 349 partim, *non Lam.*

Madras Peninsula (*Wallich* n. 3336, litt. B, *h. propr.*).

36. C. Hochstetteri (*Nees*; *Krauss in Flora*, 1845, p. 755, in nota); umbella composita; involucri bracteis longis, umbellularum sæpe lineari-caudatis; spiculis magnis, laxius spicatis, nitidis; glumis obtusis, fructus tempore vix imbricatis; nuce cum $\frac{3}{4}$ parte glumæ æquilonga, compressa, late ellipsoidea aut obovoidea.—*Steud. Cyp.* p. 11; *Boeck. in Linnæa*, xxxv. p. 471.

C. retusus, *A. Rich. Fl. Abyss.* ii. p. 485, *non Nees.*

C. albomarginatus, *Steud. Cyp.* p. 10.

C. flavicomus, *Torrey, Bot. U.S. & Mex. Bound.* p. 226; *Benth.! Fl. Austral.* vii. p. 261, *non Mich.*

C. patuliflorus, *Boeck.! in Linnæa*, xxxv. p. 473.

C. ornatissimus, *F. Muell.! Fragm. Phyt. Austral.* viii. p. 265.

Pycreus albo-marginatus, *Nees in Mart. Brasil., Cyp.* p. 9.

Glabra, annua, radicibus fibrosis. Culmus solitarius, 5–8 dm., erectus, sursum triqueter, levis. Folia plura, cum $\frac{2}{3}$ parte culmi sæpe æquilonga, lata 1 cm., minute scabra, nisi summum sæpe ad vaginas fere reducta. Bracteæ 4–5, usque ad 2–3 dm. longæ, foliis similes. Umbella 1–3 dm. in diam., nunquam decomposita; radii 4–12, usque ad 1–2 dm. longi; ochreæ 1–2 cm., truncatæ, fuscæ. Umbellulæ 1–7-radiatæ; bracteolæ sæpe 1–3 cm.; radioli 1–3 cm. Spicæ usque ad 3–6 cm. longæ, 8–20-spiculosæ. Spiculæ longæ 2 cm., latæ 3–6 mm., distantes, patulæ, 12–28-floræ; rhachilla fere exalata; gluma ima parva, oblonga, obovoidea; bracteola lineari-subulata glumam imam fertilem multum superans. Glumæ longæ 3 mm., late ellipticæ, compressæ vix carinatæ, in dorso 5–7-nerviæ, in lateribus luteæ aut brunneæ aut rubescentes, in marginibus conspicue lucide hyalinæ. Stamina 3 vel 2; antheræ lineari-oblongæ, muticæ. Stylus nuce multo brevior; rami 2, e gluma plane exserti. Nux obtusa, magna (quam *C. flavicomi* 3–4plo gravior) nigra; cellulæ extimæ quadratæ, emarcidæ, albido-hyalinæ, porosæ.—Forma typica est Kotschy n. 52, parva, umbella 4–5-radiata. Exemplum majus, Schimper n. 1199, spiculis castaneo-brunneis gaudet. Schweinfurth n. 2018 est *C. Hochstetteri*, var. *tenuis*, Boeck. in Flora, 1879, p. 546; exemplum in h. Kew est juvene, minime tenue. Forma "*ornatissima*," sp., F. Mueller, umbella lata, spiculis luteo-hyalinis nitida est; cum hac exempla indica congruunt. Schweinfurth n. 2082 est *C. patuliflorus*, Boeck. (teste auctore ipso), sed cum forma vulgari *C. Hochstetteri* omnino congruit. Forma "*albomarginata*," sp., Nees, in America meridionali indigena est; differt a formis gerontogeis nervo medio glumæ sub apice vix ac ne vix excurrente.

Africa, India, Australia, America australis, et Mexico, in regione tropicali.

Africa: Senegambia (*Roger, h. Kew*); Djur et Matamma (*Schweinfurth* nn. 2012, 2082, 2018, 1939 pro maxima parte, *h. Kew*; *Schweinfurth* n. 2012, *h. Mus. Brit.*); Nubia (*Schimper* n. 52, *hh. Kew, Mus. Brit.*); Abyssinia (*Schimper* n. 1199, *hh. Kew, Mus. Brit.*).

India: Concan et Malabar (*G. Thomson, hh. Kew, Mus. Brit.*; *Stocks, h. Calcutta*; *Beddome, h. propr.*).

Burma: Rangoon (*R. Scott, Kurz, h. Calcutta*).

Australia borealis: Sturt's Creek (*F. Mueller, h. Kew*); Arnheim Land (*F. Mueller, h. Kew*).

America meridionalis: Ecuador, in ora maris Pacifici (*Spruce* n. 6417, *hh. Kew, Calcutta*).

Mexico (*Dugès* n. 1551, *h. Kew*, spiculis læte rubris); New Mexico (*Wright* n. 1965, *h. Kew*).

Var. *β. pinguior*; in omnibus partibus pinguior; caule incrassato, vaginis magnis, laxis; umbella densa; spiculis magnis, numerosis, adgregatis; glumis usque ad 4–5 mm. longis.

Quamvis umbella, glumæ nucesque iis *C. Hochstetteri* typici aliquanto majores videntur, revera tamen arcte congruunt: species distincta esse vix potest.

Abyssinia (*Schimper* n. 1551, *hh. Kew, Mus. Brit.*).

Var. γ. *russa*; glumis russis (rubro-castaneis), paullo minus remotis (quoad cætera cum Schimper n. 1199 congruens).

C. expansus, *Bojer, Hort. Maurit.* p. 380, *non Poir.*

C. tremulus, *Baker, Fl. Maurit.* p. 409 partim, *vix Poir.*

Mauritius (*Grey, h. Kew*).

Madagascar (*Blackburn, h. Kew*; *Hilsenberg et Bojer, h. Mus. Brit.*).

‡‡ *Species in Indiâ Orientali nondum repertæ.*

37. C. FLAVICOMUS (*Vahl, Enum.* ii. p. 360 partim, *non Mich.*); umbella composita; involucri bracteis longis, umbellularum sæpe lineari-caudatis; spiculis spicatis, lineari-oblongis, lutescenti-brunneis; glumis admodum obtusis, hyalino-marginatis; nuce ellipsoidea, compressa, nigra, cellulis extimis quadratis non porosis.—*Torrey in Ann. Lyceum New York*, iii. p. 253; *Kunth, Enum.* ii. p. 15; *Boeck. in Linnæa*, xxxv. p. 470.

C. elegans, *Walt. Fl. Carol.* p. 70, *non Linn.*

C. flavicomus, Mich. Fl. Bor.-Am. i. p. 27, "spiculis 7-floris" (Pursh. Fl. i. p. 53), est *C. strigosus*, Linn.—*C. flavicomus*, Vahl, partim e *C. strigoso*, partim e *C. flavicomo* nostro, descriptus est.

America borealis: a Pennsylvania usque ad Carolina (*Elliott, h. Kew*; *Hale, h. Carey in h. Kew*); Carolina australis (*Curtiss, h. Carey in h. Kew*).

America australis (*Burchell* n. 8567, *h. Kew*); Brasil, Piauhy (*Gardner* n. 2384, *h. Kew*).

38. C. TREMULUS (*Poir. Encyc.* vii. p. 264); umbella decomposita; involucri bracteis longis, umbellularum foliaceis; spiculis spicatis, lineari-oblongis, fusco-luteis; glumis obtusis, albo-marginatis; nuce oblonga, obtusa, cellulis extimis quadratis, porosis.—*Kunth, Enum.* ii. p. 16; *Boeck. in Linnæa*, xxxv. p. 469; *Baker, Fl. Maurit.* p. 409 partim.

C. retusus, *Nees*; *Kunth, Enum.* ii. p. 115.

Pycreus retusus, *Nees in Linnæa*, ix. p. 285.

Differt a *C. Hochstetteri* spiculis, floribus nucibusque minoribus, a *C. flavicomo* nucis cellulis porosis, ab utroque umbella decomposita, nec semel composita.

Mauritius (*Sieber* n. 7, *hh. Kew, Mus. Brit.*; *&c.*).

Subgenus 3. JUNCELLUS.

Juncellus, *Griseb. Fl. Brit. W. Ind.* p. 562; *Benth. et Hook. f. Gen. Pl.* iii. p. 1044 partim.—Pycrei sectio, *Kunth, Enum.* ii.

p. 17.—Dichostylis, *Nees in Linnæa*, ix. p. 289.—Pseudopycreus, *Boeck. in Linnæa*, xxxv. p. 485 partim.

Stylus 2-fidus; rami lineares. Nux compressa, facies rhachillæ adpressa. Spiculæ multi-(10–60-)floræ, persistentes. Rhachillæ alæ angustæ, persistentes. Filamenta 3–1; antheræ cristatæ aut muticæ. Glabræ, foliaceæ. Inflorescentia varia.

This is Bentham's *Juncellus* without *Anosporum*. Boeckeler has included in his *Pseudopycreus*, *Cyperus stoloniferus*, which with me has a 3-fid style; and he has put *C. pygmæus* in *Eucyperus*, Sect. Aristati, an arrangement to which he must have been led by the inflorescence; but which seems to me very unnatural, and opposed to his definition of the group. The species here included in *Juncellus* exhibit great variety in habit and inflorescence, but they are at all events easily discerned by the nut. The confusion I have got into about *C. diaphanus* is because the type specimen has the nut exceedingly young; and without comparison I am not sure that my ripe Calcutta *C. diaphanus* is the same species.

* *Umbellæ radii manifesti* (cf. etiam *C. diaphanum*).

39. C. Monti (*Linn. f. Suppl.* p. 102); robusta; umbella composita, spiculis (sæpe dense) spicatis; glumis late ovatis, obtusis, in dorso subplanis late 7–9-nerviis; nuce ½ partem glumæ superante.—*Host, Gram.* iv. p. 38, t. 67; *Berl. Fl. Ital.* i. p. 272; *Reich. Ic. Fl. Germ.* viii. t. 279; *Sturm, Fl. Deutsch.* xiii. t. 52; *Ledeb. Fl. Ross.* iv. p. 240; *Gren. et Godr. Fl. Franç.* iii. p. 361; *Willk. et Lange, Fl. Hisp.* i. p. 137; *Parl. Fl. Ital.* ii. p. 22; *Boiss. Fl. Orient.* v. p. 336.

C. serotinus, *Rottb. Descr. et Ic.* p. 31; *Kunth, Enum.* ii. p. 19; *Boeck. in Linnæa*, xxxv. p. 492.
C. longus, *Linn.* ! *h. propr.*
C. puncticulatus, *Aitch.* ! *Punjab Pl.* p. 189, *in Journ. Linn. Soc.* xix. p. 189, *non Vahl.*
— Monti, *Bonon. Prod.* p. 12, t. 1. fig. 2.

Stolones 2–4 mm. in diam., vaginati. Culmi solitarii, 3–10 dm., apice triquetri, leves. Folia 2–5, cum culmo sæpe æquilonga, lata 7–10 mm., sursum antice scabra. Bracteæ 3–5, usque ad 2–5 dm. longæ, erecto-patentes, foliis similes. Umbellæ radii 3–6, usque ad 5–15 cm. longi, admodum inæquales, compressi, sursum triquetri; ochreæ 8–15 mm. truncatæ; umbellulæ breviter corymbosi aut fere simplices; radioli 3–10, breves, a bracteola lineari-caudata suffulti, aut nudi; rhachis 5–30 mm., glabra aut minute setuloso-scabra, nec pilosa. Spiculæ in unaquaque spica 5–40, undique spicatæ, longæ 10–15 mm., latæ 4 mm., 12–30-floræ, compressæ turgidæ, lateribus parallelis; rhachilla tetragona, conspicue quadratim excavata, vix alata; gluma ima ovato-lanceolata, interdum seti-caudata, cæteris longior. Glumæ non carinatæ, rubræ, fuscæ aut pallescentes, per $\frac{1}{2}$–$\frac{2}{3}$ latitudinem a nervis striatæ; margines anguste scarioso-hyalinæ. Filamenta 3, anguste ligulata, levia, persistentia; antheræ lineari-oblongæ, muticæ (obsolete cristatæ), rubræ. Stylus brevis; rami 2, sæpissime e gluma vix exserti (in paucis exemplis longius exserti). Nux rhachi contrarie admodum compressa, paullo curvata, in facie interiore contra rhachin adpressa, subconcava, in facie exteriore convexa, minime 2-sulcata (nisi immatura ut in iconibus pluribus depicta), nigro-brunnea; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, persistentes, non porosæ, obscuræ.

Ab Europa australi usque ad Himalayam, China et Amurland.

Europa (*Reichenbach* n. 2311, *hh. Kew, Mus. Brit.*); Corsica *Mabille* n. 187, *hh. Kew, Mus. Brit.*); Lyon (*Billot* n. 86, *h. Mus. Brit.*; *Bourgeau* n. 32, *h. Mus. Brit.*); Tuscany (*Billot* n. 86 bis, *h. Mus. Brit.*); Verona (*Reichenbach, h. Mus. Brit.*); Carniola (*Schwægrichen, h. Calcutta*); Croatia (*Schlosser* n. 857, *h. Mus. Brit.*); Hungary (*Frivaldsky, h. Mus. Brit.*).

Asia occidentalis: Caucasus; Astrakhan; Cabul (*Griffith* n. 6188 partim, *h. Kew*); Punjab (*T. Thomson* n. 1589, *h. Kew*; *Aitchison* n. 494, *hh. Mus. Brit., Calcutta*); Kashmir (*Jacquemont* n. 1138, *h. Kew*; *W. S. Atkinson* n. 24199, *h. Calcutta*); Chumba, alt. 1000 metr. (*C. B. Clarke* n. 24276, *hh. Kew, Calcutta*).

Asia orientalis: Amurland, Kengka Lacus (*Maack, h. Kew*); China, Pekin (*Hance* n. 6531, *h. Kew*; *Maximowicz* n. 484, *h. Kew*); Shantung (*Maingay* n. 157, *hh. Kew, Calcutta*).

Var. β. (?) *stylosa*; spiculis castaneo-rubris, a styli ramis longis, longissime exsertis, comosis.

India Orientalis: Montes Khasia (*Griffith, h. Kew*).

40. C. INUNDATUS (*Roxb. Hort. Beng.* p. 6, *Fl. Ind.* i. p. 201, *Ic. ined.* t. 110 *in h. Kew, nec Nees, nec R. Br.*); robusta; umbella decomposita, majuscula, patente; spiculis spicatis, distantibus, majusculis, compressis, linearibus; glumis obtusis, late ellip-

ticis, in dorso subplanis conspicue striato-nervosis; nuce majuscula, rotundato-ellipsoidea, compressa.

Cyperus, *Wall.* ! *List* n. 3342, B.

Culmus 5–8 dm., solitarius, erectus, crassus, basi compressus, sursum acute triqueter. Folia 3–5, cum $\frac{2}{3}$ parte culmi sæpe æquilonga, lata 8–14 mm., carinata, in marginibus parum scabra. Bracteæ 3–6, usque ad 5 dm. longæ, 2 cm. latæ, foliis similes, basi auriculato-saccatæ, patentes. Umbella 3–5 dm. in diam., densa; radii c. 7, usque ad 5–20 cm. longi; umbellulæ corymbosæ iterum corymbosim subramosæ; ochreæ usque ad 2 cm. longæ, fuscæ, truncatæ, obscure bilabiatæ; umbellularum bracteæ lineari-caudatæ. Spicæ 2–4 cm. longæ, 10–16-spiculosæ; rhachis glabra. Spiculæ rectangulatim divaricatæ, usque ad 2 cm. longæ, 3–4 mm. latæ, 16–36-floræ, fuscæ; rhachilla subtetragona, robusta, vix alata; gluma ima ovato-lanceolata, interdum caudata, cæteris longior. Glumæ spissæ, majusculæ, latæ, in marginibus hyalinæ; margines in sicco sæpe involutæ. Stamina 3; filamenta anguste ligulata, levia; antheræ lineari-oblongæ, muticæ (obsolete cristatæ), flavæ, sanguineo-maculatæ. Stylus brevis; rami 2, e gluma breviter exserti. Nux majuscula, late rotundata (neque basi angustata), contra rhachillam compressa, in faciebus subconcava, brunnea; cellulæ extimæ quadratæ, hyalinæ, persistentes, obscuræ. —Species *C. procero* ab externo similis, cum hoc intermixta; *Cypero Monti* e visceribus simillima, ab hoc nonnisi inflorescentia laxiore vix distinguenda.—In ripis fluminis Ganges per æstus submersa (*Roxburgh*); in ripis fluminis Woosung per æstus submersa (notula Maingayi).

From Boeckeler's index it appears that his final treatment of *C. inundatus*, Roxb., is to be found on p. 505, which, after hours of hunting, I have never been able to find.

Bengalia: Calcutta (*Buchanan-Hamilton, h. Wallich* n. 3342 B *in h. Linn. Soc.*; *Kurz, h. Calcutta*); in lacubus Jheels dictis (*T. Anderson, h. Calcutta*; *&c.*); Burisaul (*C. B. Clarke* n. 8460, *h. Kew*).

China: Shanghai (*Maingay* n. 639, *h. Calcutta*).

41. C. ALOPECUROIDES (*Rottb. Descr. et Ic.* p. 38, t. 8. fig. 2); umbella composita aut decomposita, densispiculosa; spicis cylindricis, undique densissime spiculigeris; glumis ovatis, breviter mucronatis aut lanceolatis; nuce parva, ellipsoidea, compressa, pallide brunnea aut straminea.—*R. Br. Prod.* p. 217; *Nees in*

Wight Contrib. p. 76; *Kunth, Enum.* ii. p. 19; *Webb et Berth. Iles Canaries, Phyt.* iii. p. 361; *Dalz. and Gibs. Bomb. Fl.* p. 282; *Boeck. in Linnæa,* xxxvi. p. 322, var. *α* excl.; *Benth. Fl. Austral.* vii. p. 264; *Boiss. Fl. Orient.* v. p. 367, syn. Delile excl.; *non Roxb.*

C. compositus, *R. Br. Prod.* 217 (*fide Benth.*).
Cyperus, sp., *Wall.*! *List* n. 3344.

Radix fibrosa. Culmus (interdum 2–3) robustus, usque ad 1 metr. longus, sursum trigonus, levis. Folia 2–4, longa, interdum cum culmo æquilonga, latiuscula, coriacea, in marginibus (sæpe in carina quasi-alata) aculeato-scabra, rarius (in forma australi) levia. Umbella magna, spiculis innumerosis; involucri bracteæ plures, usque ad 3–7 dm. longæ, foliis similes. Umbellæ radii 5–10, usque ad 5–10 cm. longi; ochreæ 1–3 cm., a dentibus 2 longis lanceolatis (interdum longis 1–2 cm. foliaceis) terminatæ. Umbellulæ a bracteis foliaceis sæpe suffultæ, haud raro iterum umbellatim divisæ. Spicæ plures, sessiles, longæ 1–5 cm., cylindricæ. Spiculæ rectangulatim patentes, longæ 8 mm., latæ 2–3 mm., lanceolatæ, compressæ, subtetragonæ, 12–24-floræ; gluma ima ovato-caudata, cæteris longior, persistens; rhachilla non alata, pro magnitudine spicularum robusta, tetragona, proventu alte excavata. Glumæ spissæ, in sicco laxius imbricatæ, marginibus sæpe involutis, in dorso planæ, ecarinatæ, pallidæ aut luteo-brunneæ. Stamina 3; filamenta ligulata, levia; antheræ lineari-oblongæ, muticæ. Stylus cum nuce æquilongus; rami 2, e gluma mediocriter exserti. Nux cum $\frac{1}{3}$ parte glumæ æquilonga, ellipsoidea, utrinque æqualiter angustata, facie interiore plana, exteriore leviter convexa, sæpius (imperfecte maturata) pallida; matura griseo-brunnea.—Species a Boeckeler (et a Benth. et Hook. f. Gen. Pl. iii. p. 1044), cum *C. divite,* Delile, conjuncta, ideoque a Benth. et Hook. f. ad subgenus *Juncellum,* a Boeck. ad subgenus *Eucyperum* (sect. *Exaltatos*) relata. Mihi videntur 2 species inter se *remotæ,* viz.:—

α. alopecuroides; stylo 2-fido; nuce compressa; rhachilla robuste tetragona, alte excavata, subexalata (*Juncellus*).

β. dives; stylo 3-fido; nuce plane trigona; rhachilla tenui compressa, hyalino-alata (*Eucyperus*: *Exaltati*).

Exemplum australiense a cæteris omnibus recedit spicis ovoideis, glumis minus dense stipatis, staminibus 2, antheris magnis. In exemplis africanis, glumæ late ovatæ aut obovatæ

acumine brevi; in exemplis Indicis glumæ ovato-lanceolatæ conspicue plicato-striatæ videntur.

Ins. Madeira (*Lowe, hh. Kew, Mus. Brit.*).

Ins. Teneriffe (*Bourgeau* n. 462, *h. Kew*).

Ins. Virides (*Barker-Webb* n. 100, *h. Kew*).

Senegambia (*Brunner, hh. Kew, Mus. Brit.*).

Egypt: Alexandria (*Letourneux* n. 147, *non* n. 147 bis, *h. Kew*).

Kordofan (*Kotschy, h. Kew*).

Ins. Seychelles (*Horne* n. 221, *h. Kew*).

India Orientalis: Punjab (*T. Thomson, h. Calcutta*); Peshawur (*Griffith* n. 199 *a*, *h. Kew* n. 6150); Moradabad (*T. Thomson* n. 347, *h. Kew*); Scinde (*Stocks, h. Kew*); Bombay (*Jacquemont* nn. 422, 438, *h. Kew*); Madras (*Heyne, h. Mus. Brit.*; *Koenig, h. Mus. Brit.*; *Wight* n. 2877, *h. Calcutta*).

Zeylania (*Thwaites C. P.* n. 3560, *hh. Kew, Calcutta*).

[India Occidentalis: Ins. Guadaloupe (*Husnot* n. 2, *hh. Kew, Mus. Brit.*) an allata ?.]

The young specimens of this are very like those of *C. dives*, and I am not surprised that those who depend on hand-and-eye sorting, and have not looked at the style, have mixed them. In the mature *C. alopecuroides* the glumes fall early from the lower part of the spikelet; the stout tetragonous deeply-notched rhachilla of *Juncellus* is then conspicuous, and the examples are in this state easily sorted out by hand and eye. When I named the English material, I had not learnt the value of this character; but, as I looked at the style in every specimen, I believe the above list of numbers and localities must be right. I should, however, add that I feel much less confident about the literature, which I have been unable to go over again out here; some of the quotations may belong, at least in part, to *C. dives*.

42. C. Barteri (*Boeck. in Linnæa*, xxxv. p. 460); umbella simplice laxiuscula; spiculis paucis, fasciculatis, compressis, inflatis, albidis; glumis ovatis, obtusis, concavis, viridi-striatis; nuce magna, contra rhachin compressa, obovoidea, in facie interiore concava, exteriore curvata, convexa.

Niger flumen (*Barter* n. 1563, *h. Kew*); Nupe (*Barter, h. Calcutta*).

Djur (*Schweinfurth* n. 1939, partim admixt., *h. Kew*).

** *Umbella capitata.*

43. C. LÆVIGATUS (*Linn.*! *Mant.* p. 79); rhizomate repente; umbella capitata, specie laterali; involucri bracteis 2, altero quasi culmum producente; glumis spissis, concavis, obtusis, albis, pallidis aut castaneo-maculatis; nuce obovoidea aut ellipsoidea, obtusa, cum $\frac{2}{3}$ parte glumæ æquilonga.—*Rottb. Descr. et Ic.* p. 19, t. 16. fig. 1; *Boeck. in Linnæa,* xxxv. p. 486; *Benth. Fl. Austral.* vii. p. 263; *Cosson, Expl. Algér., Glum.* p. 250; *Boiss. Fl. orient.* v. p. 366; *Ser. Watson, Bot. California,* ii. p. 214.

C. mucronatus, *Rottb. Descr. et Ic.* p. 19, t. 8. fig. 4; *H. B. K. Nov. Gen. et Sp.* i. p. 203; *Roxb. Fl. Ind.* i. p. 185; *Nees in Wight Contrib.* p. 72; *Kunth, Enum.* ii. p. 17; *Webb et Berth. Iles Canaries, Phyt.* iii. p. 360; *Parl. Fl. Ital.* ii. p. 21; *C. Gay, Hist. Chile,* vi. p. 163; *Benth. Pl. Hartw.* p. 27; *Liebm. Mex. Halfgr.* p. 15; *Griseb. Fl. Brit. W. Ind.* p. 362.

C. lateralis, *Forsk. Fl. Æg. Arab.* p. 13; *Roxb. Fl. Ind.* i. p. 186, *Ic. ined.* t. 2014 *in h. Kew*; *Nees in Wight Contrib.* p. 73.

C. pleuranthus, *Nees in Wight Contrib.* p. 73.

C. leucostachys, *Willd.*; *Link, Jahrb.* iii. p. 81.

C. monostachyus, *Link*! *in Buch. Ins. Canaries,* p. 138, *non Rottb.*

C. acuminatus, *Roxb. h. propr., Ic. ined.* t. 704 *in h. Kew.*

C. Cossyrensis, *Tineo in Guss. Fl. Sicul.* ii. p. 779.

C. viridulus *et* C. reptans, *Boeck. in Linnæa,* xxxv. p. 485.

C. rivularis, *Steud. in Lechler* n. 1547, *non Kunth.*

Pycreus mucronatus *et* P. lateralis, *Nees in Linnæa,* ix. p. 283.

P. lævigatus, *Nees in Linnæa,* x. p. 130.

Cyperus, *Wall.*! *List* n. 3311.

Rhizoma modo breve, culmis uniseriatim adgregatis, modo elongatum, a vaginis laxis castaneis ornatum, culmos distantes proferens. Culmi 1–5 dm., tenues aut crassiusculi, sursum trigoni, leves; vaginæ 2–3, longiusculæ, truncatæ, basin arcte integentes. Folia interdum cum culmo æquilonga, straminea, involuta, sæpius brevia, haud raro omnia ad mucrones vaginarum fere reducta. Involucri bracteæ 2, altera erecta, 2–10 cm. longa, foliis similis, basi interdum dilatata, altera multo brevior, patens. Spiculæ dense congestæ, 10–30, aut in formis debilibus vel alpinis 10–1, longæ 1 cm., latæ 2 mm., 16–40-floræ, compressæ, turgidæ. Glumæ dense imbricatæ, albidæ, sæpe plus minus castaneo-maculatæ, in dorso pallidæ aut fuscæ, raro virides; nervi 7–11 per $\frac{2}{3}$ latitudinem glumæ extensi; rhachilla tetragona, excavata, non alata. Stamina 3; filamenta late ligulata, fere levia; antheræ oblongæ, flavæ, a crista lanceolata, rubra, scabra, terminatæ. Stylus cum nuce subæquilongus; rami 2, e gluma breviter exserti. Nux in forma typica cum $\frac{2}{3}$ parte glumæ æquilonga, in forma macra africana $\frac{1}{2}$ parte glumæ brevior, in exemplis parvulis sæpe vix gluma brevior, compressa, in facie interiore plana aut concava, obtusa, brunnea; cellulæ extimæ quadratæ, albidæ, persistentes.—Forma andina *reptans* (sp. Boeck.) differt spiculis angustis, castaneis.—Forma Andina *viridula* (sp. Boeck. = *C. rivularis*, Steud.) differt foliis viridulis (nec stramineis) gramineis.—Forma africana *macra* differt spiculis magnis (longis 15 mm. latis 3 mm.) interdum tortis, glumis magis acutatis.

Both Menzies and Hillebrand note that the finest mats in the Sandwich Isles are made of this species.

Europa meridionalis, Africa cum Insulis, Asia occidentalis usque ad Indiam, Australia, Polynesia, America australis, et Mexico.—Species cosmopolitana.

Europa: Nice (*Bentham, h. Calcutta*); Sicilia (*Tineo, h. Kew*; *Citarda, hh. Mus. Brit., Calcutta*).

Africa: Ins. Madeira (*Lowe* n. 77, *h. Mus. Brit.*); Ins. Canary (*Bourgeau* n. 1568, *h. Kew*; *Lemann, h. Calcutta*); Ins. S. Vincent (*Webb* nn. 99, 114, 138, *h. Kew*); Ins. Cap Verd (*Vogel* n. 64, *h. Kew*; *Melliss* n. 160, *h. Kew*); Mogadore (*J. D. Hooker, h. Kew*); Niger flumen (*Vogel, h. Kew*); Libya (*Ascherson* n. 2308, *h. Kew*); Kosser (*Schweinfurth* n. 2009, *hh. Kew, Mus. Brit.*); Abyssinia, alt. 1000 metr. (*Schimper* n. 2160, *hh. Kew, Mus. Brit.*); Mauritius (*Sieber* n. 15, *hh. Kew, Mus. Brit.*); Ile de France (*Du Petit-Thouars, h. Mus. Brit.*); Ins. Rodriguez (*Balfour, hh. Kew, Mus. Brit.*); Ins. Socotra (*Balfour* n. 27, *h. propr.*); Arabia Petræa (*Macdonald, h. Kew*); Egypt (*Aucher-Eloy* n. 3796, *h. Kew*); Suez (*Schweinfurth, h. Kew*; *&c.*); Alexandria (*Aucher-Eloy, h. Calcutta*); Ins. Rhodes (*Postian*, n. 655 *h. Kew*).

[Forma *macra*. Mauritius (*Blackburn, h. Kew*); in fontibus Nili fl. (*Grant, h. Kew*); Somali-land (*Hildebrandt* n. 1474, *hh. Kew, Mus. Brit.*); Zambesi-land (*Meller, h. Kew*); Natal (*Gerrard* n. 488, *h. Kew*); Cape-Town (*Harvey* n. 188, *h. Kew*; *Rehmann* n. 1786 *h. Mus. Brit.*).]

Asia: Syria (*Bové* nn. 27, 30, *h. Kew*); Cabul (*Griffith* n. 1265, *h. Kew* n. 6215, n. 6215 *h. Calcutta*).

India Orientalis, in regione occidentali et Madras: Punjab (*Jacquemont* n. 133, *h. Kew*; *T. Thomson, h. Calcutta*); Kashmir, Bhimbur (*Stewart* nn. 799, 871, *h. Calcutta*);

Campbellpore (*Stewart* n. 56, *h. Calcutta*); Marwar (*G. King, h. Calcutta*); Madras Peninsula (*Wight* n. 2389, *h. Kew*; *Heyne in Wallich* n. 3311, *h. Calcutta*).

[Forma *macra*. Australia: Swan River (*Drummond* n. 7, *h. Kew*, n. 325 *h. Mus. Brit.*); Portus Gregory (*Oldfield, h. Kew*).]

Ins. Sandwich (*Hildebrandt* n. 521, *h. Kew*; *Menzies, h. Mus. Brit.*).

Chili (*C. Gay, h. Kew*).

Lima (*Seemann, h. Calcutta*).

La Plata: Tucuman (*Tweedie, h. Kew*).

Mexico (*Hartweg* n. 240, *h. Kew*; *W. G. Wright, h. Kew*; *Schaffner, h. Kew*).

Ins. Jamaica (*Macnab, h. Kew*; *Latrobe, h. Mus. Brit.*).

[Forma *viridula*. America australis: Peru, Arica (*Lechler* n. 1547, *hh. Kew, Calcutta*); Lima (*Seemann* n. 871, *h. Kew*); Banda Or. (*Tweedie, h. Kew*).]

[Forma *reptans*. America tropicalis: Andes Ecuador (*Spruce* nn. 5910, 5911, *hh. Kew, Calcutta*); Mexico (*Schmitz* n. 806, *h. Mus. Brit.*).]

Var. β. *junciformis*; capitulo 6–1-spiculigero; spiculis sæpe elongatis multifloris; glumis atro-castaneis, viridi-carinatis; nuce ellipsoidea aut ovoidea cum ½–⅔ parte glumæ æquilonga.

C. junciformis, *Desf.*! *Fl. Atlant.* i. p. 42, t. 7. fig. 2; *Cav. Ic.* iii. p. 2, t. 204. fig. 1; *Reich. Ic. Fl. Germ.* t. 278. fig. 661; *Boss. Fl. Orient.* v. p. 367.

C. distachyos, *Allioni, Fl. Pedem. Auctuarium*, p. 48, t. 2. fig. 5; *Parl. Fl. Ital.* ii. p. 19; *Willk. et Lange, Fl. Hisp.* i. p. 137; *Ball in Journ. Linn. Soc.* xvi. p. 700.

C. mucronatus, *Sibth. Fl. Græc.* i. p. 34, t. 49.

C. lævigatis, var. picta, *Boeck. in Linnæa*, xxxv. p. 487.

C. mucronatus, var. γ, *Kunth, Enum.* ii. p. 18.

Per regionem mediterraneam, ubique sparsa.

Europa australis: Lusitania, Algarbia (*Welwitsch* n. 285, *h. Mus. Brit.*); Hispania, Murcia (*Bourgeau* n. 983, *h. Kew*); Cadiz (*Clementi, h. Calcutta*); Malaga (*Salzmann, h. Calcutta*; *Boissier, h. Calcutta*); Italia, Parma, Agrigento (*h. Kew*); Apulia (*Porta et Rigo* n. 246, *h. Kew*); Attica (*Heldreich* n. 52, *h. Kew*).

Insulæ Mediterraneæ: Sicilia, Palermo (*Todaro, h. Calcutta*); Candia (*Sieber, h. Kew*); Girapetro (*Desfontaines, h. Cal-*

cutta); Melita (*Duthie, h. Mus. Brit.*); Ile de Scyra (*h. Calcutta*); Cyprus (*Sintenis et Rigo* n. 353, *hh. Kew, Mus. Brit.*).

Africa borealis: Mogadore (*J. D. Hooker, h. Kew*): Barbaria (*Desfontaines, h. Mus. Brit.*); Algiers (*Munby* n. 26, *hh. Kew, Calcutta*; *Balansa* nn. 140, 736, *hh. Kew, Mus. Brit.*); Damietta (*Sieber, h. Kew*).

Asia occidentalis: Syria (*Lowne, h. Calcutta*); Arabia (*Schimper* n. 218, *hh. Kew, Mus. Brit.*); Persia (*Haussknecht, h. Kew*); Herat (*Bunge* n. 7, *h. Kew*); Cabul (*Griffith* n. 198, *h. Kew* 6199, n. 6199 *Calcutta*); Beloochistan (*Duke* n. 69, *h. Calcutta*); Scinde (*Stocks* n. 751, *h. Calcutta*); Punjab, Peshawur (*Stewart, h. Calcutta*).

44. C. PANNONICUS (*Jacq.*! *Austr.* v. *App.* p. 29, t. 6); radice fibrosa, annua; spiculis 3–8, congestis; involucri bracteis 2, altera basi dilatata, suberecta; glumis dense stipatis, concavis, obtusis, stramineis castaneo-rubro-notatis; nuce ellipsoidea, cum gluma fere æquilonga, chlorito-brunnea.—*Linn. f. Suppl.* p. 103; *Host, Gram.* iii. p. 47, t. 70; *Sturm, Fl. Deutsch.* xiii. t. 52; *Reich. Ic. Fl. Germ.* t. 278. fig. 660; *Wulfen. Fl. Norica*, p. 53; *Griseb. Spicil. Fl. Rumel.* p. 420; *Boeck. in Linnæa*, xxxv. p. 487; *Boiss. Fl. Orient.* v. p. 367.

C. mucronatus, var., *Ledeb. Fl. Ross.* iv. p. 240; *Kunth, Enum.* ii. p. 18.

Pycreus pannonicus, *Reich. Fl. Germ.* p. 72; *Nees, Genera Pl. Germ.* ii. t. 22. figs. 1–13.

Hungaria (*Reichenbach, h. Kew*; *Gouan, h. Kew*; *Bentham, h. Calcutta*); Velencze (*Tauscher, h. Calcutta*); Plattensee (*Bilimek, h. Mus. Brit.*).

— sine habitat. (*Jacquin, h. Mus. Brit.*; n. 14, *h. Linn. propr.*).

Euxini littora (*Sibthorp, h. Mus. Brit.*).

45. C. DIAPHANUS (*Schrad.*; *Roem. et Sch. Syst.* ii. *Mant.* p. 477); umbella 3–1-radiata, contracta aut capitata; spiculis paucis, fasciculatis, latiusculis, albidis; glumis ovatis, obtusis, in lateribus diaphanis estriatis; stylo bifido.—*Kunth, Enum.* ii. p. 9; *Boeck. in Linnæa*, xxxv. p. 437.

Radix tenuiter fibrosa. Culmi cæspitosi, 10–15 cm., graciles. Folia gracilia, culmo longiora. Involucri bracteæ 3, usque ad 15 cm. longæ, erecto-patentes, debiles; umbellæ radii 0–2 cm.

Spiculæ in unoquoque radio 3–5, longæ 8 mm., latæ 3 mm., compressæ, anguste ovatæ, 6–12-floræ. Glumæ longæ 2–3 mm., arctius imbricatæ, compressæ, in dorso anguste viridi-3-nerviæ, in lateribus latis lucide hyalino-albidæ. Stamina 2; antheræ breviusculæ, oblongæ, muticæ, exsertæ. Stylus cum nuce immatura æquilongus; rami 2, e gluma breviter exserti.

Nepaul (*Wallich, h. Kew*).

The above was drawn up at Kew, and is (beyond doubt of mine) the same species as described by Boeckeler, also from a Nepaul specimen of Wallich's. The flowers in my specimen were too young. Boeckeler says his nut was immature; but, while describing it as obovoid, he does not separately say it was compressed parallel to the rhachis; he, however, places the species at the head of *Pycreus.*

In the Calcutta herbarium are complete ripe specimens of a *Cyperus* collected by Vicary at Saugor in Central India, which is undoubtedly a *Juncellus.* In all essential points, and in the peculiar diaphanous glumes, it agrees with my description (and recollection) of *C. diaphanus.* *Either*, therefore, we have here two distinct species, very like each other, *diaphanus* and *Vicaryi*; *or diaphanus* has been wrongly referred, and is really a *Juncellus*, of which the subjoined is a hot-country var. or form.

Var. (?) *β. Vicaryi*; capitulo globoso, 10–20-spiculoso; spiculis linearibus, 8–14-floris; nuce obovoidea, contra rhachin compressa, facie interiore concava, exteriore angustissime carinata, concava, cum $\frac{1}{3}$ parte glumæ æquilonga, pallida, juniore superne quasi a rore glandulosa.

Habitus, folia, bracteæ *C. diaphani*, sed culmus vix 1 dm. longus.

India centralis: Saugor (*Vicary, h. Kew*).

46. C. LIMOSUS (*Maxim.*! *Prim. Fl. Amur.* p. 294); umbella contracta aut capitata; spiculis lineari-oblongis, acutis, teneris; glumis ovatis, obtusis, 3-nerviis; nuce oblonga, plano-convexa, luteo-brunnea.

C. pygmæus, var., *Boeck. in Linnæa,* xxxv. p. 494 in notâ.

Umbellæ radii 3–6, 5–15 mm. longi.

Amur flumen (*Maximowicz, h. Kew*).

47. C. PYGMÆUS (*Rottb. Descr. et Ic.* p. 20, t. 14. figg. 4, 5); umbella capitata, admodum densa; spiculis sæpe curvatis aut tortis; glumis biseriatis, ovato-lanceolatis (neque sursum latiori-

bus) 5–7-nerviis; nuce ellipsoidea aut oblonga, utrinque angustata, cellulis extimis parum laxis.—*Nees in Wight Contrib.* p. 72; *Kunth, Enum.* ii. p. 18; *Cav. Ic.* vi. p. 65, t. 588. fig. 2; *Benth. Fl. Austral.* vii. p. 262, nota excl.; *Cosson, Expl. Algér., Glum.* p. 252; *Boiss. Fl. Orient.* v. p. 368; *Boeck. in Linnæa*, xxxv. p. 493, var. β excl.

C. Mulenpulla, *Roem. et Sch. Syst. Mant.* ii. p. 99.
C. pugioniformis, *Dietr. Sp. Pl.* ii. p. 230.
C. Michelianus, *Link, Hort. Berol.* i. p. 303.
C. hyalinolepis, *Steud. Cyp.* p. 316.
C. monocephalus, *Roxb. h. propr., et Ic. ined. in h. Kew, non Fl. Ind.*
C. squarrosus, *Roxb. Fl. Ind.* i. p. 194, *Ic. ined.* ii. t. 54. fig. 95, *h. Calcutta, non Linn.*
Pycreus diffusus, *Nees in Linnæa*, ix. p. 283.
Dichostylis pygmæa, *Nees in Linnæa*, ix. p. 289.
Cyperus, *Wall.* ! *List* n. 3325 B, C.
Cyperus sp., n. 58, *Herb. Ind. Or., Hook. f. et T. Thoms.*
Isolepis, *Wall.* ! *List*, n. 3484 C partim.

Glabra, annua. Culmi cæspitosi (usque ad 120), longi 3–25 cm., rigidiusculi, sursum trigoni, leves. Folia 2–4, graminea, cum culmo sæpe æquilonga, plana, sursum minute scabra. Bracteæ 3–5, divaricatæ, usque ad 8–16 cm. longæ, foliis similes. Capitulum 1–2 cm. in diam., densissime congestum, sæpe 100-spiculosum; radii plures, obsoleti, nunquam evoluti. Spiculæ longæ 6–10 mm., latæ 1–2 mm., compressæ, albo-virides, proventu cinnamomeo-fuscæ, 8–24-floræ; rhachilla tenuissima, tenuissime bialata, undata. Glumæ spissæ, persistentes, tenues, fructus tempore plane biseriatæ, raro quodammodo irregulares, carinato-naviculares, basin versus sæpe scariosæ nervis evanidis, a marginibus hyalinis basi subdecurrentes. Stamina 2–1; filamenta anguste ligulata, fere levia; antheræ lineari-oblongæ, muticæ, flavæ. Stylus sæpe cum nuce subæquilongus; rami 2, e gluma breviter exserti. Nux cum $\frac{1}{3}$ parte glumæ æquilonga, in facie interiore (contra rhacheolam adpressa) subplana, in facie exteriore convexa curvata, interdum obscure angulata, brunnea; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, persistentes, non laxæ; ideoque nux non (ut in *Isolepide Micheliana*) a margine lucide hyalino sub lente circumdata.

Ab Algeria usque ad Amurland, China, Australia.

Africa borealis: Algiers (*Kralik* n. 90, *h. Kew*); Nubia (*Kotschy* n. 329, *hh. Kew, Mus. Brit.*); Egypt (*Sieber, h. Kew*; *Schweinfurth* n. 2010, *h. Mus. Brit.*).

Asia occidentalis: Syria (*Bové, h. Kew*); Aleppo (*Russell, h. Mus. Brit.*); Bagdad (*Haussknecht, h. Mus. Brit.*).

India, communis, præsertim in planitie tropicali: Kashmir (*Jacquemont* n. 1087, *h. Kew*); Punjab (*T. Thomson, h. Calcutta*); Lucknow (*T. Anderson*, n. 14, *h. Calcutta*); Bengalia (*Roxburgh, h. Mus. Brit.*; *Griffith* n. 6185, *h. Calcutta*; *C. B. Clarke* n. 11740); Madras Peninsula (*Wight* n. 1807, *h. Kew*; *Wight* n. 2862, *h. Calcutta*; *G. Thomson, h. Calcutta*); Ceylon (*Thwaites C. P.* n. 3947, *h. Mus. Brit.*).

Burma (*Wallich* n. 3484 partim, *h. propr.*); Meaday (*R. Scott, h. Calcutta*); Pegu (*Kurz* n. 646, *h. Calcutta*).

Amurland: Ussuri (*Maack, h. Kew*).

China: Shanghai (*Maingay* n. 634, *h. Calcutta*).

Australia subtropicalis (*Bidwell* n. 142, *h. Kew*); Victoria fl. (*F. Mueller, h. Kew*).

Var.? β. *Aztecorum*; spiculis planis; glumis ovatis, distanter 3-nerviis; nuce a basi lata ovoidea subconica, stramineo-brunnea, quasi-scabrida.

C. pygmæus, *Liebm. Mex. Halfgr.* p. 15.

Culmi folia inflorescentia *C. pygmæi*.

Mexico: Pital (*Liebmann, h. Kew*).

Cuba: Havana (*Liebmann, h. Kew*).

Subgenus 4. EUCYPERUS.

Eucyperus, *Boeck. in Linnæa,* xxxv. p. 493 (sect. Spicatis Leptostachyis, Marisco, Diclidio *exclusis*).—Eucyperus (cum maxima parte Papyri), *Benth. et Hook. f. Gen. Pl.* iii. pp. 1043, 1044.—Cyperus (C.), *Kunth, Enum.* ii. p. 20 (pro maxima parte).

Stylus 3-fidus. Nux (interdum inæqualiter) trigona aut subrotunda.

Species plurimæ. Habitus generis.—Spiculæ multifloræ, raro pluri-(4–6-)floræ.

This subgenus contains the great bulk of the genus; *Pycreus* and *Juncellus* are comparatively small groups, of convenient size, split off from it by (what I hold) definite characters. *Diclidium* and *Mariscus* are two more groups of convenient size, which I here cut off by (what I hope will be found) definite characters. There still remains an enormous mass of species, which Boeckeler is only able to deal with by forming clusters of allied species, nowhere separated from each other by contrasted differential (nor

indeed workable) characters. It would be very convenient to split off more groups by definite characters, and it would still more facilitate a satisfactory dealing with the genus if we could dichotomize *Eucyperus* (as it here stands). This Benth. et Hook. f., Gen. Pl. iii. p. 1043, have endeavoured to do by admitting *Papyrus* and *Eucyperus* as subgenera. This, I regret to say, appears to me impossible to work with: the only distinction is that the wing of the rhachilla is more prominent in *Papyrus* than in *Eucyperus*. This is at best a poor and indefinite character; but, beyond that, the exceptions to it are so numerous (even after rearranging many species in Boeckeler) that it is really little help towards finding the place of a species.

To enumerate but a few instances:—In *C. glomeratus*, Linn., and *C. eleusinoides*, Kunth, the wing is well developed, yet these species stand (and must stand) in *Eucyperus*. *C. lucidulus*, Klein, has an evident subsoluble wing, and has therefore been forced by Boeckeler into *Papyrus*; but its affinity is clearly with *C. compressus*, where Hook. f. et T. Thoms. placed it. Boeckeler has similarly divaricated *C. jeminicus*, Rottb., and *C. usitatus*, Burchell, in attempting to preserve the character of the wing of the rhachilla as sectional. The character runs so irregularly, indeed, that if the subgenus *Papyrus* is maintained (on its present character in Benth. et Hook. f.) distinct from *Eucyperus*, the natural affinity of species will be broken into at very numerous places; and the line between *Papyrus* and *Eucyperus*, "the degree of development of the wing," will then be arbitrary, indefinable, and useless to work with. It is an additional but superfluous argument to add that in many, as in *C. tegetum*, the development of the wing varies very greatly in degree in the same species. Though, therefore, I am unable to propose any better dichotomization of *Eucyperus* than Benth. et Hook. f., and though I would most willingly have bolstered it up if I could have discovered any propping subordinate characters, I here abandon it, and fall back on a system of mere groups, as in Kunth or Boeckeler, and attempt merely to improve these (as to the Indian species especially) in detail. The series proceeds "generally," as in Boeckeler, from the groups with an inconspicuous wing to those with the wing of rhacheola conspicuous. By the removal of the series with persistent glumes, deciduous spikelets, and by some simplifications, I have considerably reduced the unwieldy number of groups in Kunth and Boeckeler. This, however, may be a doubtful advan-

tage, as the more groups are made the more tangibly they may be defined.

Sect. A. *Aristati.*

Aristati, *Kunth, Enum.* ii. p. 20; *Boeck. in Linnæa,* xxxv. p. 97.

Annuæ, humiles, glabræ, cæspitosæ, foliatæ. Umbella specie simplex aut capitata, in *S. amabili* interdum composita; spiculæ numerosæ fasciculatæ aut breviter densius spicatæ, compressæ; rhachillæ alæ angustæ, insolubiles. Glumæ carinatæ, aristatæ aut mucronatæ, raro muticæ. Stamina sæpius 1–2; antheræ parvæ, oblongæ, muticæ, ut styli rami vix aut brevissime e gluma exsertæ. Nux castanea, brunnea aut lutea, neque (ut sæpe in sect. *Haspan*) marmoraceo-albida.

This is a natural small group, nor is there much difficulty or difference of opinion what species should be placed in it. But the name is unfortunate: not only do equally aristate glumes occur in most groups of *Eucyperus,* but in several of the Aristati the glume is merely minutely mucronate, and in *C. amabilis* often absolutely muticous.—Of Boeckeler's species (which I have not been able to take up) in this section, Mr. Bentham has removed elsewhere *C. flaccidus,* R. Br., *C. trinervis,* R. Br.; and I have a note by me that *C. seslerioides* ought to stand next *C. leucocephalus,* Retz., below.

* *Spiculæ digitatæ.*

48. C. AMABILIS (*Vahl, Enum.* ii. p. 318); umbella capitata, simplice, composita aut decomposita; spiculis digitatis, aureo-brunneis; glumis truncatis, subemarginatis, mucrone brevi vel obsoleto; nuce anguste obovoidea obtusa, quam ½ pars glumæ paullo breviore.—*Kunth, Enum.* ii. p. 108.

C. microstachyus, *Vahl, Enum.* ii. p. 318; *Kunth, Enum.* ii. p. 108.
C. aureus, *H. B. K. Nov. Gen. et Sp.* i. p. 205; *Kunth, Enum.* ii. p. 21; *Boeck. in Linnæa,* xxxv. p. 494.
C. aurantiacus, *H. B. K. Nov. Gen. et Sp.* i. p. 205; *Kunth, Enum.* ii. p. 30; *Benth. in Hook. Niger Fl.* p. 549; *Nees in Mart. Brasil., Cyp.* p. 25.
C. oligostachyus, *H. B. K. Nov. Gen. et Sp.* i. p. 204; *Kunth, Enum.* ii. p. 20.
C. brachyphyllus, *Willd.*; *Link, Jahrb.* iii. p. 82.
C. quitensis, *Spreng. Syst.* i. p. 224.
C. lepidus, *Hochst.*!; *Steud. Cyp.* p. 14.

C. glareosus, *Liebm.! Mex. Halfgr.* p. 16.
Cyperus sp. n. 24, *Herb. Ind. Or., Hook. f. et T. Thoms.*

Radix annua, tenuiter fibrosa. Culmi cæspitosi, pauci, longi 2–17 cm., trigoni, leves. Folia 2–3, culmo (sæpius multo) breviora. Involucri bracteæ plures, 1–10 cm., in umbellis bene evolutis umbella sæpius breviores. Umbellæ radii 4–15, usque ad 1–11 cm. longi, tenues; umbella sæpius specie simplex aut capitata, sed umbellularum radioli interdum 3–6, usque ad 1–5 cm. longi. Spiculæ in unoquoque radio 5–20, radiatim digitatæ, bracteatæ (*i. e.* capitulum revera compositum) aut ebracteatæ, usque ad 24 mm. longæ, 1–2 mm. latæ, 16–28-floræ aut rarius 40–50-floræ; rhachilla tenuis. Glumæ subdistantes, in sicco vix imbricatæ, ovatæ, in dorso viridi-3–5–7-nerviæ, in lateribus hyalinæ nitide brunneæ. Stamen (in planta Indica) 1; anthera minima, oblonga, mutica, e gluma non exserta. Stylus nuce brevior; rami 3, e gluma brevissime exserti. Nux obtusissima, symmetrice subacute trigona, lucide brunnea; cellulæ extimæ quadratæ, hyalinæ, persistentes nec porosæ.

[*C. glareosus,* Liebm., a Mexico, paullo recedit; in hoc spiculæ pallidiores, glumæ conspicue 3-nerviæ, mucro cum ¼ parte glumæ æquilongus.]

India orientalis, Africa tropicalis et australis cum insulis, et America tropicalis.

India orientalis, boreali-occidentalis, et centralis: Chota Nagpore, alt. 1–600 metr. frequens (*C. B. Clarke* n. 24889); Moradabad (*T. Thomson, hh. Kew, Calcutta,* n. 393 *h. Mus. Brit.*); Naini Tal (*Col. Davison, h. Kew*); Kumaon (*G. King, h. Calcutta*).

Insulæ Mascarenses &c.: Socotra (*Balfour, h. Calcutta*); Mayotta (*Boivin, h. Kew*); Nossibé (*Pervillé* n. 488, *h. Kew*); Madagascar (*Gerard* n. 95, *h. Kew*; *Pervillé* n. 521, *h. Kew*).

Africa, centralis et australis: Nubia (*Kotschy* n. 139, *hh. Kew, Mus. Brit.*); Ador (*Petherick, h. Kew*); Djur et Bongo (*Schweinfurth* nn. 193, 2183, 2256, *h. Kew*); Quorra flumen (*Vogel* n. 193, *h. Kew*); Africa australi-occidentalis, lat. austr. 23° (*Chapman et Baines, h. Kew*); Goldfields, lat. austr. 27° (*Baines, h. Kew*).

America: Cuba (*C. Wright* n. 3356, *hh. Kew, Mus. Brit.*); Orizaba (*F. Mueller* n. 1986, *h. Kew*); Guatemala (*Skinner, h. Kew*); Surinam (*Weigelt, h. Mus. Brit.*=C. coercens, *Reich.*); Maracaybo (*Sonder* n. 1571, *hh. Kew, Mus. Brit.*); Venezuela (*Moritz* n. 683, *h. Mus. Brit.*; *Funcke* n. 701, *h. Mus. Brit.*); Guiana Anglorum (*Schomburgk* n. 221, *hh. Kew, Mus. Brit.*); Brasil (*Burchell* nn. 8488, 8528, 8639, *h. Kew*); Para (*Spruce* n. 88, *h. Kew*); Santarem (*Spruce* n. 745, *h. Kew, h. Calcutta*).

49. C. CASTANEUS (*Willd. Sp. Pl.* i. p. 278); umbella specie simplice (raro capitata), radiis longiusculis, spiculis digitatis; glumis emarginatis, mucrone longiusculo sub apice excurrente; nuce oblonga, obtusa, quam ½ pars glumæ (mucrone excluso) longiore, pallida.—*Roxb. Fl. Ind.* i. p. 195; *Nees in Wight Contrib.* p. 79; *Kunth, Enum.* ii. p. 21; *Boeck. in Linnæa*, xxxv. p. 496 (*Wall.* n. 3376 B excl.); *Benth. Fl. Austral.* vii. p. 267.

C. squarrosus, var. stenocarpa, *F. Muell. Fragm. Phyt. Austral*, viii. p. 262.

C. pusillus, *Wight* (*h. propr.*) *MS.*

Cyperus sp., *Wall.* ! *List* n. 3323.

Radix annua, tenuiter fibrosa. Culmi cæspitosi, pauci, longi 3-10 cm., trigoni, leves. Folia 2-3, cum culmo æquilonga aut sæpius breviora. Umbellæ radii 3-6, tenues, 1-5 cm. longi (aut umbella capitata); involucri bracteæ 3-5, cum umbella æquilongæ aut longiores; ochreæ 3 mm., truncatæ. Spiculæ in unoquoque radio 4-16, longæ 1-3 cm., latæ 1-2 mm., 15-70-floræ, compressæ; bracteæ usque ad 10-15 mm. longæ, lineares (*i. e.* umbellula revera composita), aut breviores aut 0. Glumæ spissæ, in dorso carinatæ virides, obscurius 3 5-nerviæ, in lateribus (in forma typica) nitide castaneæ, modo brunneæ modo pallidæ; mucro robustus, viridis, ½ parte glumæ subbrevior, paullo recurvatus. Stamina 2-1; antheræ parvæ, breviter oblongæ, muticæ, e gluma non exsertæ. Stylus nuce brevior; rami 3, e gluma breviuscule exserti. Nux oblonga, basi breviter angustata (vix obovoidea), trigona, paullo curvata, neque triquetra, pallide brunnea aut lutea; cellulæ extimæ quadratæ, hyalinæ, persistentes.—Roxburghii et Rottleri exempla sub nomine *C. castaneo* conservata sunt *C. castaneus*, Willd.; in Roxb. Ic. ined. in h. Kew sub hoc nomine, gluma lanceolato-acutata, nux apice acuta, depictæ sunt —tabula mihi dubia.

India Orientalis, cum Zeylania: Sikkim et Nepaul orient. (*J. D. Hooker, h. Kew*); Bengalia, in planitie Mymensingho (*C. B. Clarke* n. 17294); Pegu *Maclelland, h. Calcutta*);

Mergui (*Griffith* n. 43, *h. Kew*); Chota Nagpore, Parasnath, alt. 500 metr. (*C. B. Clarke* n. 24896); Madras Peninsula (*Wight* n. 1821, *h. Kew*; *Koenig, h. Mus. Brit.*; *Roxburgh, h. Mus. Brit.*; *Wight in Wallich* n. 3323, *h. Calcutta*); Zeylania (*Thwaites, C. P.* n. 803, *hh. Kew, Calcutta*).

Australia: Queensland (*Leichardt, h. Kew*).

This is a critical, comparatively rare species, from which the wide-spread *C. cuspidatus* is with difficulty distinguishable.

C. castaneus was originally founded on its chestnut colour, and in the typical form the glumes are chestnut-red to chestnut-black, a colour hardly found in all *C. cuspidatus*. Boeckeler, however, says the glumes are "sanguineo-spadiceæ v. raro rufo-ferrugineæ nitidæ:" this is because Boeckeler worked with small material, of which some of the best would be Thwaites n. 803; but some of Thwaites's no. 803 (which, with Thwaites and Boeckeler, I call true *C. castaneus*) is very pale, with a little obscure dull red about it, and not at all shining. The fact is that (as in most cases) colour fails us as a diagnostic mark, and is given up by Boeckeler, who keeps up the two species solely on the difference in the length and shape of the nut. This difference, though well marked in many specimens, becomes very obscure in others. An auxiliary character is that in *C. cuspidatus* the glume is very conspicuously 3-nerved, much less conspicuously in *C. castaneus*; but this character is not to be depended on. The mucro of the glume is often more curved in *C. cuspidatus*, but not always. If the two species are to be distinguished, it must be solely by the nut as Boeckeler has got it.

Wall. List n. 3376 B, both at Calcutta and in h. propr., is most typical *C. cuspidatus*, var. *angustifolia*; Boeckeler refers this number to *C. castaneus*, but the Wallichian herbarium is so mixed that this proves nothing.

50. C. CUSPIDATUS (*H. B. K. Nov. Gen. et Sp.* i. p. 104); umbella specie simplice rarius capitata, radiis longiusculis, spiculis digitatis; glumis emarginatis, plane trinerviis, mucrone sub apice longe excurrente; nuce anguste obovoidea, obtusa, fusco-atra, quam $\frac{1}{2}$ pars glumæ (mucrone excluso) longiore.—*Kunth, Enum.* ii. p. 22; *Nees in Mart. Brasil., Cyp.* p. 24; *Boeck. in Linnæa*, xxxv. p. 496; *Benth. Fl. Austral.* vii. p. 267.

C. exiguus, *Nees! in Mart. Brasil., Cyp.* p. 22.

C. Salzmanni, *Steud.! Cyp.* p. 1 .

C. castaneus, *Hochst. in Hohenack.* n. 824; *Hance, h. propr.*; *Miq. Fl. Ind. Bat.* iii. p. 261, *vix Willd.*
C. contractus *et* C. solutus, *Steud. Cyp.* pp. 13, 14.
C. squarrosus, *F. Muell. Fragm. Phyt. Austral.* viii. p. 262, *non Linn.*
Cyperus, *Wall.*! *List* n. 3376 A partim.

Radix annua, tenuiter fibrosa. Culmi cæspitosi, pauci, longi 3-12 cm., trigoni, leves. Folia 2-3, angusta, cum culmo æquilonga aut sæpius breviora. Umbellæ radii 2-6, usque ad 1-5 cm. longi, tenues (vel raro umbella capitata); ochreæ 3-5 mm. Spiculæ in unoquoque radio 5-20, longæ 15 mm., latæ 2 mm., 12-30-floræ, compressæ; bracteæ usque ad 10-15 mm. longæ (*i. e.* umbellula revera composita), lineares, aut breviores aut 0. Glumæ approximatæ, imbricatæ, valide 3-nerviæ, nervis viridibus aut brunneis, in lateribus hyalino-castaneæ aut brunneæ, enerviæ; mucro recurvatus, cum $\frac{1}{3}$–$\frac{2}{3}$ parte glumæ æquilongus. Stamina 2 vel 1; antheræ breves, oblongæ, e gluma vix exsertæ. Stylus nuce brevior; rami 3, e gluma breviuscule exserti. Nux trigona, non symmetrica, lateribus vix parallelis, cellulæ extimæ quadratæ, hyalinæ, persistentes (*cf.* fig. 38, 39), minime tuberculato.

Africa, Asia, Australia, America; in regione tropicali.

Africa: Niger flum. (*Barter* n. 1569, *hh. Kew, Calcutta*); Sierra Leone (*Smeathmann, h. Mus. Brit.*); Nilus flum., Madi (*Grant, h. Kew*).

Asia:—India Or. in regione boreali a Kashmir usque ad Assam, frequens: Kashmir, alt. 1000 metr. (*C. B. Clarke* n. 31570, *h. Kew*); Sikkim (*G. King, h. Calcutta*); Lucknow (*Bonavia,* n. 236, *h. Calcutta*); Khasia Colles, alt. 800 metr. (*J. D. Hooker* n. 1818, *h. Kew*); Assam (*Jenkins, h. Calcutta, &c.*); Chota Nagpore, alt. 600 metr. (*C. B. Clarke*); Bengalia orientalis (*Griffith, h. Kew* n. 6202, n. 6202 *h. Calcutta*); Pegu (*Maclelland, h. Calcutta*).

Java (*Zollinger* n. 3739, *h. Kew*).

China: Whampoa (*Hance* n. 7461, *hh. Kew, Calcutta*); Macao (*Lay, h. Mus. Brit.*); Hongkong (*Forbes, h. Mus. Brit.*).

Ins. Philippine (*Cuming* n. 676, *hh. Kew, Mus. Brit.*).

Borneo (*Motley* n. 900, *h. Kew*; *Burbidge, hh. Kew, Mus. Brit.*).

Australia: Queensland (*fide Bentham*).

America: Brasil (*Burchell* n. 957, *h. Kew*; *Spruce* nn. 101, 2041, *hh. Kew, Mus. Brit.*, n. 2041 *h. Calcutta*); Guiana Anglorum (*Schomburgk* n. 824, *hh. Kew, Mus. Brit.*); Mexico (*Liebmann, h. Kew*).

[Forma *angustifolia*; spiculis brevioribus, sæpe pallidis; nuce late obovoidea, quam ½ pars glumæ (mucrone excluso) sæpe breviore, trigona, faciebus sæpe concavis.

C. angustifolius, *Buch.-Ham.* sp.; *Nees in Wight Contrib.* p. 79.
C. pusillus, *Wight MS. in h. propr.* n. 2337, *non Vahl.*
C. aristatus, *Herb. Ind. Or., Hook. f. et T. Thomson, partim.*
Cyperus sp., *Wall.*! *List* n. 3376 B, A partim.

India Orientalis, sat vulgaris: Nepaul (*Wallich, h. Linn. Soc.*, n. 3312 C partim *h. Calcutta*); Sikkim (*G. King, h. Calcutta*); Bengalia orientalis (*Griffith, hh. Kew, Calcutta* n. 6203/1); Assam (*Simons, h. Calcutta*); Monghyr (*Buchanan-Hamilton in Wall.* n. 3376 B, *h. Calcutta*); Madras Peninsula (*Wight* n. 2337, *h. Kew*).

Zeylania (*Beckett, h. Calcutta*).

I think this was made a species by those who did not know, or who forgot to compare *C. cuspidatus*. I do not think it is worthy of notice as a variety, but I would sink *C. angustifolius* among the synonyms of *C. cuspidatus* type.]

Var. β. *Burchellii*; culmis nanis; spiculis numerosis, magnis. Spiculæ longæ 25 mm., latæ 3–4 mm., 50–60-floræ, pallidæ.

Var. notabilis; differt a *C. cuspidato* typ. ut *C. pectiniformis* β, Nees, differt a *C. compresso*.

Brasil (*Burchell* n. 9642, *h. Kew*).

51. C. UNCINATUS (*Poir. Encycl.* vii. p. 247); umbella contracta (aut capituliformi), radiis paucis, paucispiculosis; spiculis digitatis, compressis; glumis emarginatis, mucrone sub apice breviter excurrente; nuce obovoidea, obtusa, cum ½ parte glumæ subæquilonga.—*Kunth, Enum.* ii. p. 21; *Boeck. in Linnæa*, xxxv. p. 502.

C. pectinatus, *Hils. et Bojer*! *in h. propr., non Vahl.*

Folia culmis sæpe longiora, uncinata. Spiculæ longæ 1 cm., latæ 2 mm., 8–16-floræ, castaneæ aut viridi-brunneæ.—Species a *C. cuspidato* ægre distinguenda.

Madagascar (*Lyell* n. 84, *h. Kew*; *Grey, Blackburn, h. Kew*; *Du Petit-Thouars, h. Mus. Brit.*).

52. C. PARAGUAYENSIS; umbella capitata; glumis spissis, obtusis vix emarginatis, mucronatis; nuce obovoidea, obtusa, quam ½ pars glumæ breviore, fusco-nigra.

Radix fibrosa (perennis?). Culmi longi 2–7 cm., basi incrassati. Spiculæ longæ 8 mm., latæ 2 mm., 12–28-floræ, pallidæ aut fusco-brunneæ; rhachilla subrobusta, excavata. Glumæ carinatæ; mucro ½ parte glumæ paullo brevior.—Species *C. pumilo* similis, sed stylus trifidus. Confer *C. uncinatulum*, Schrader; Nees in Mart. Brasil., Cyp. p. 23; Boeck. in Linnæa, xxxv. p. 497; in quo autem glumæ patulæ, fructiferæ remotæ, nux stramineo-pallida.

Paraguay (*Balansa* nn. 419, 420, *h. Kew*).

*** Spiculæ (sæpius dense) spicatæ.*

53. C. ARISTATUS (*Rottb. Descr. et Ic.* p. 23, t. 6. fig. 1); umbella specie simplice vel capituliformi; glumis e basi ovata lanceolato-acuminatis, per totam fere latitudinem conspicue multinerviis; nuce oblonga vel anguste obovoidea obtusa, cum ⅓–½ parte glumæ æquilonga.—*Kunth, Enum.* ii. p. 23 (syn: Burmanni excl.); *Roxb. Fl. Ind.* i. p. 190; *Nees in Wight Contrib.* p. 78; *A. Rich. Fl. Abyss.* ii. p. 478; *Boeck. in Linnæa,* xxxv. p. 500; *F. Muell. Fragm. Phyt. Austral.* viii. p. 261; *Sereno Watson, Bot. California,* ii. p. 214.

C. squarrosus, *Linn. Amœn. Acad.* iv. p. 303; *Sp. Pl.* 66, h. propr. partim, *nec Rottb.*; *Benth. Fl. Austral.* vii. p. 268.
C. intricatus, *Linn. Mant.* p. 182.
C. inflexus, *Muehl. Descr. Gram.* p. 16; *Torrey in Ann. Lyceum New York,* iii. p. 273; *C. Gay, Hist. Chile,* v. p. 164; *F. Muell. Fragm. Phyt. Austral.* viii. p. 262.
C. uncinatus, *R. Br. Prod.* p. 215; *Pursh. Fl. Am. Sept.* i. p. 50, *non Poir.*
C. Purshii, *Roem. et Sch. Syst.* ii. p. 177.
C. Brownei, *Roem. et Sch. Syst.* ii. p. 228; *Kunth, Enum.* ii. p. 111.
C. pygmæus, *Nutt. in Amer. Phil. Trans.* new series, v. p. 142, *non Rottb.*
C. versicolor, *Nees in Wight Contrib.* p. 78.
C. arenarius, *Wight MS. in Wall. List* n. 3374, *non Retz.*
C. falciculosus, *Liebm. Mex. Halfgr.* p. 16.
Scirpus lappaceus, *Lam. Ill.* i. p. 139.
Isolepis echinulata, *Kunth, Enum.* ii. p. 205.
Cyperus, *Wall.*! *List* n. 3375.
Cyperus, *Wall.*! *List* n. 3374 (forma versicolor).
Cyperus, *Wall.*! *List* n. 3376, plagula 2 partim (n. 3).

Radix annua, tenuiter fibrosa. Culmi, 2–14 cm. longi, cæspitosi, sursum trigoni, modo tetragoni modo bialati. Folia 2–3, flaccide graminea, cum culmo sæpe æquilonga. Involucri bracteæ 2–5, usque ad 5–10 cm. longæ, umbella sæpius multo longiores; radii 2–6, usque ad 1–6 cm. longi, aut umbella capitata. Spiculæ in unoquoque radio multi rarius pauci, dense spicati, quoad magnitudinem magnopere variabiles; in exemplis evolutis spiculæ in unoquoque radio 12, sublaxe spicatæ, plane compressæ, lucidæ, longæ 12 mm., latæ 2–3 mm.; in exemplis minus evolutis spiculæ minores, minus compressæ, fusco-virides, globoso- aut cylindrico-congestæ: umbellulæ subebracteatæ, sæpe autem plane compositæ. Glumæ carinatæ, 7–11-nerviæ, apice in mucronem attenuatæ, virides, fuscæ, pallidæ, aut rufescenti-brunneæ, rarius lutescentes, nervis sæpius viridibus. Stamen 1; anthera parva, oblonga, e gluma non exserta. Stylus nuce brevior; rami 3, e gluma vix exserti. Nux trigona, fusco-brunnea; cellulæ extimæ quadratæ, hyalinæ, persistentes.—Sub hac specie, formæ plures militant, scil.:—

Forma *princeps*; umbella laxa, pluriradiata; spiculis magnis laxiuscule spicatis, compressis, pallidis aut lucidis, luteis vel subcastaneis; nuce plane obovoidea.—Forma in Himalaya et in Africa tropicali maxime reperta.

Forma *alpina*; quasi formæ præcedentis forma alpina; culmis elongatis, tenuibus; umbella 2–1-radiata; bracteis 2, altera erecta quasi culmum producente; spiculis paucis, magnis.—Kashmir.

Forma *campestris*; umbella sæpe 3-radiata; spiculis minimis, viridibus, densissime spicatis.—Bengal.

Forma *versicolor*; umbella pauciradiata aut capitata; spiculis densissime spicatis; rhachillis sæpe tortis; glumis longissime aristatis; spiculis fructigeris sæpe rufescenti-brunneis.—Madras Peninsula.

Forma *inflexa*; quasi inter formas principem et campestrem intermedia; umbella quam *principis* densiore tam *campestris* laxiore, spiculis quam *principis* minoribus tam *campestris* majoribus, sæpius fusca-viridibus interdum pallidis.—America; sed exempla gerontogea omnino eadem.

Linnæus, quam in h. propr. tam in descriptionibus editis, 2 species confunderat; ejus descriptio (quoad spiculas ferrugineas) ad *C. versicolorem*, Nees, maxime spectat, ejus ic. citat. autem est species a *C. aristato* diversa. Rottbœll e Linnæano *C. squarroso* 2 species diversas bene extricavit et depinxit, alteri nomen *C. squarrosum*, Linn., alteri nomen *C. aristatum*, Rottb., tribuit. Quum quæ ita sint, nomenclaturam auctorum Boeckelerique accepi; quamvis nomenclatura Benthami cum Linnæo fortasse melius congruat.

[*Scirpus hamulosus*, Steven in Mém. Soc. Natur. Mosc. v. p. 356, =*Isolepis hamulosa*, Kunth, Enum. ii. p. 205, is reduced to *Cyperus aristatus* by Boeckeler. It is (to me) clearly an *Isolepis*. But besides this, the material is so very distinct specifically from *Cyperus aristatus* (even if it be put in *Cyperus*), that I almost doubt whether the Berlin herbarium can have got the true plant.]

Africa tropicalis; India; Australia; America fere tota.

Africa: Niger flumen (*Vogel* n. 13, *h. Kew*); Nupe (*Barter*, *h. Calcutta*); Senegambia (*h. Kew* n. 328); Dammara-land (*Een*, *h. Mus. Brit.*); Nilus flumen (*Grant*, *h. Kew*); Nubia (*Kotschy* n. 50, *hh. Kew*, *Mus. Brit.*); Abyssinia (*Schimper* nn. 437, 822, 855, 1208, 1735, 2155, *hh. Kew*, *Mus. Brit.* n. 822 *h. Calcutta*; *Hildebrandt* nn. 365, 366, *h. Mus. Brit.*).

Ins. Socotra (*Balfour* n. 507, *h. propr.*).

India Orientalis, alt. 0–2800 metr., ab Himalaya usque ad Zeylaniam, vulgaris: Tibet, Kargil (*Stoliczka*, *h. Calcutta*); Himalaya, Piti (*T. Thomson*, *h. Kew*); Dalhousie, alt. 1500 metr. (*C. B. Clarke* n. 22845); Himalaya occidentalis (*Brandis* nn. 3326, 3327, *h. Calcutta*); Ghurwal (*G. King*, *h. Calcutta*); Sikkim, Lachoong, alt. 2800 metr. (*J. D. Hooker*, *h. Kew*); Peshawur (*Jacquemont* n. 1276, *h. Kew*); Poona (*Jacquemont* n. 315, *h. Kew*); India centralis (*G. King*, *h. Calcutta*); Madras Peninsula (*Wight* nn. 1819, 1820=C. versicolor, *h. Kew*).

Zeylania (*Thwaites*, *C. P.* n. 966, *hh. Kew*, *Mus. Brit.*, *Calcutta*).

Australia, tropicalis et centralis: Dampier's Archipelago (*Walcott*, *h. Kew*); sinus Carpentaria (*F. Mueller*, *h. Kew*); Herbert's Creek (*Bowman*, *h. Kew*).

America borealis, fere tota: Canada (*Richardson*, *h. Kew*); Winipeg Lacus (*Drummond*, *h. Kew*); Oregon (*Geyer* n. 445, *h. Carey in h. Kew*); Kentucky (*Short*, *h. Mus. Brit.*); Massachusetts (*Tuckerman*, *h. Mus. Brit.*); Alabama (*Buckley*, *h. Calcutta*); Texas (*Drummond* n. 448, *hh. Kew*, *Mus. Brit.*, *Calcutta*); California (*Hartweg* n. 2019, *hh. Kew*, *Mus. Brit.*; *Palmer* n. 385, *h. Mus. Brit.*); Mexico Nova (*C. Wright* n. 1951, *h. Kew*, n. 702 *hh. Kew*, *Mus. Brit.*); Mexico, Vera Cruz (*F. Mueller* n. 2154, *h. Kew*).

America centralis et meridionalis (exempla a Brasilia nondum a me visa): Yucatan (*Schott* nn. 77, 910, *h. Mus. Brit.*); Ecuador, Chanduy (*Spruce* n. 6416, *hh. Kew, Calcutta*); Chili (*Germain, hh. Kew, Mus. Brit.*); Paraguay (*Balansa* n. 418, *h. Kew*).

Var. (?) β. *Maingayi*; glumis obovatis, in mucronem breviusculum subito angustatis, in dorso viridibus conspicue 5–7-nerviis, in marginibus sursum latiuscule albescentibus, enerviis.

Viridis. Culmi 1 dm. tenues. Bracteæ usque ad 5–8 cm., angustæ, virides. Umbellæ radii 1–4, usque ad 2 cm. longi, 5–9-spiculosi. Spiculæ plane spicatæ, nec digitatæ, 9–11-floræ.

China borealis: Shantung (*Maingay* n. 84, *h. Calcutta*).

54. C. SQUARROSUS (*Linn. Amœn. Acad.* iv. p. 303, *Sp. Pl.* p. 66, h. propr. partim); umbella simplice aut capitata; spiculis spicatis, linearibus; glumis remotis, ovato-lanceolatis mucronatis; nuce anguste oblonga, subobtusa, quam ½ pars glumæ giore.—*Rottb. Descr. et Ic.* p. 25, t. 6. fig. 3; *Nees in Wight Contrib.* p. 75; *Kunth, Enum.* ii. p. 22; *Dalz. & Gibs. Bomb. Fl.* p. 281; *Boeck. in Linnæa* xxxv. p. 501.

C. maderaspatanus, *Willd. Sp. Pl.* i. p. 278 (*syn. Pluk. excl.*); *Benth. Fl. Austral.* vii. p. 268 in notâ.
C. hyalinus, *Heyne in Wall. List* n. 3313, *non Vahl.*
Pycreus squarrosus, *Nees in Linnæa*, ix. p. 283.
Cyperus, *Wall.*! *List* n. 3313 A, B partim.
Cyperus, *Wall.*! *List* n. 3312, D partim.

Radix annua, fibrosa. Culmi cæspitosi, longi 5–15 cm., trigoni, leves. Folia 2–3, graminea, culmo sæpe longiora. Involucri bracteæ 3–5, usque ad 6–12 cm. longæ, patentes. Umbellæ radii 2–6, breves, rarius 2 cm. superantes, aut 0. Spiculæ in unoquoque radio 6–20, spicatæ, divaricatæ, longæ 8–12 mm., latæ vix 1 mm., compressæ, 10–18-floræ, virides vel brunnescentes; spicæ a bracteola viridi, 3–4 mm. longæ, sæpe suffultæ, rarius subcompositæ. Glumæ distantes, adpressæ, in dorso valide viridi-3–5-nerviæ; margines latiusculi, hyalini, estriati; apex obtusus; mucro sub apice excurrens, cum ½ parte glumæ vix æquilongus. Stamen 1. Stylus nuce multo brevior; rami 3, vix exserti. Nux anguste oblonga, trigona, obscure curvata, apice subito angustata, apiculata, fusco-brunnea; cellulæ extimæ quadratæ, albidæ, hyalinæ.—A *C. aristato* spiculis anguste linearibus, glumis remotis primo intuiter distinguenda.

India Orientalis: Bengal (*Masters, h. Kew*); Madras Peninsula (*Wight* n. 1810, *h. Kew*); Mangalore (*Hohenacker* n. 823, *h. Kew*).

Ins. Comorin (*Bouton, hh. Kew, Mus. Brit.*).

Var. β. *lancinux*; spiculis majoribus, longis 2 cm., latis 2–3 mm., 12–28-floris; glumis minus remotis, in lateribus plicato-striatis, mucrone fere terminali; nuce unsymmetrica, obliqua, in uno latere concava, apice conspicue lanceolata.

Exempla optima Griffithii a *C. squarroso* bene diversa videntur; exempla autem intermedia in herbario Griffithii ipsius aliorumque reperiri possunt.

Peninsula Malayana: Mergui (*Griffith* nn. 18, 337, *h. Kew* n. 6203).

Sect. B. *Compressi.*

Compressi, *Kunth, Enum.* ii. p. 23 (C. jeminico *excl.*); ***Boeck.* *in* *Linnæa*,** xxxv. p. 505, partim.

Foliaceæ, virides, nec cinnamomeo-brunnei (nisi *C. rubicundus*). Umbella pauciradiata, specie simplex aut fere simplex (nisi *C. Griffithii*); radii longi (nisi *C. rubicundus*). Spiculæ fasciculatæ aut spicatæ, compressæ (nisi *C. Griffithii*). Glumæ imbricatæ, sæpius mucronatæ. Rhachilla fere exalata. Stamina 3. Nux late ellipsoidea aut subovoidea, majuscula, subæqualiter acute triquetra.

The group here called Compressi is natural, *i. e.* united by a great number of characters, if we leave out *C. Griffithii* and *C. rubicundus*. *C. Griffithii* is kept here because it is so like *C. radians* that it has been united therewith specifically by Boeckeler; and though the structure of its spikelets (as well as its inflorescence) is totally remote from that characterizing the group, it has for the present to be arranged here as an anomalous species. *C. amabilis* in its colour and capitate inflorescence might perhaps be moved to the Sect. Arenarii, but the strongly mucronate glumes do not suit.

Kunth has only three species in his group Compressi, and of these *C. jeminicus*, as Boeckeler rightly arranges it, belongs to the Corymbosi. Boeckeler, on the other hand, has 33 species of Compressi; many of these (of the non-Indian ones) I have not taken up at all in this paper; but omitting these, I remove many of Boeckeler's Compressi, as follows:—

C. usitatus, Burchell, is very close to *C. jeminicus*, and belongs to the Corymbosi.

C. proteinolepis, Steud., has woolly roots, and belongs to the Sect. *Galeria*; indeed, it is hardly possible to extricate it specifically from *C. glomeratus* and *C. curvulus*.

C. babakensis is, I think, only one of the endless varieties of *C. pilosus*; and, if a subspecies, must go with *C. pilosus*.

C. obtusiflorus, *C. margaritaceus*, and *C. niveus* differ from my type of Compressi in their stramineous or cinnamomeous tinge, in their capitate inflorescence, very closely packed concave obtuse glumes, and broad filaments—in a word they belong exactly to my type of Arenarii.

I take *C. compressus* as the type of my Compressi, and (omitting the two doubtfully placed here, *C. Griffithii* and *C. rubicundus*) the half-dozen species collected under Compressi are pretty clearly allied to it. But it is much more difficult to say why various other species should not be brought here also. The Compressi are one of the groups that touch the Corymbosi. Even *C. sphacelatus* itself, with its annual root, thin umbel, and green colour, seems to me exceedingly near *C. compressus*, much nearer to it indeed than to *C. articulatus*, which stands at the head of the Corymbosi. The only reason for not placing *C. sphacelatus* among the Compressi must be the wing of the rhachilla, which, though narrow and inconspicuous, is oblanceolate on each notch of the rhacheola in a manner more characteristic of the Corymbosi than of the Compressi. Still my best reason for not placing *C. sphacelatus* among the Compressi is that I find it among the Corymbosi.

Among the Glomerati several differ from the Compressi by hardly any character except that the rays are shorter, the spikes longer in proportion, giving the inflorescence a denser character. *C. strigosus* even hardly differs in laxness of spikes, and the wing of the rhachilla is very narrow; while the small group Glutinosi differ only by trivial characters.

The difficulty thus is not to pick out a group of 6 or 8 species allied to *C. compressus*, but to show how such group differs from all other species of *Eucyperus*, which difficulty I leave virtually untouched. I think the stout, subequally triquetrous nut at least as important as any of the characters insisted on by Boeckeler.

55. C. COMPRESSUS (*Linn.*! *Sp. Pl.* p. 68, *et h. propr.*); viridis; umbella specie simplice, laxa, spiculis lineari-oblongis; glumis ovatis, acuminatis, acutis, carinatis, multinerviis; styli ramis 3, e gluma vix exsertis; nuce obovoidea, obtusissima, triquetra faciebus subconcavis.—*Rottb. Descr. et Ic.* p. 27, t. 9. fig. 3; *Roxb. Fl. Ind.* i. p. 194; *H. B. K. Nov. Gen. et Sp.* i. p. 207; *Torrey, in Ann. Lyceum New York,* iii. p. 270; *Meyer, in Mém. Acad. St. Pétersb.* 6 ser. i. t. 3 (non visa); *Kunth, Enum.* ii. p. 23; *Nees in Wight Contrib.* p. 77, *in Mart. Brasil., Cyp.* p. 29; *Hassk. Pl. Jav. Rar.* p. 77; *Dalz. & Gibs. Bomb. Fl.* p. 282; *Baker, Fl. Maurit.* p. 410; *Saunders & Baker, Ref. Bot.* t. 240; *Boeck. in Linnæa,* xxxv. p. 517; *Boiss. Fl. Orient.* v. p. 372; *non Jacq.*

C. brachiatus, *Poir. Encyc.* vii. p. 259.
C. conglomeratus, *Willd. Enum. Suppl.* p. 5 (*fide Nees*).
C. pectiniformis, *Roem. et Sch. Syst. Mant.* ii. p. 128, *syn. Roxb. excl.*; *Nees in Wight Contrib.* p. 77, *syn. excl.*
C. Meyenii, *Nees et Meyen in Pl. Meyen.* p. 57.
Cyperus, *Wall.*! *List* n. 3308.
Cyperus, *Wall.*! *List* n. 3314 C.
Cyperus, *Griff. Itin. Notes,* p. 12, n. 167.
Cyperus, *Griff. Itin. Notes,* p. 362, n. 191.
— *Sloane, Jamaica,* i. p. 117, t. 76. fig. 1.
— *Pluk. Alm.* t. 417. fig. 2 (?).

Radix fibrosa. Culmi cæspitosi, 1–35 cm. longi, trigoni, leves. Folia 2–3, viridia, cum culmo sæpe æquilonga, sursum vix scabra. Umbella 7–2-radiata (interdum capitata); radii usque ad 6–16 cm. longi; ochreæ 5–15 mm. longæ, truncatæ. Involucri bracteæ 3–5, usque ad 10–15 cm. longæ, patentes. Umbellulæ 5–12-spiculosæ, congestim corymbosæ, sæpius e spica simplice constantes. Spiculæ longæ 1–3 cm., latæ 4 mm., 12–40-floræ, lateribus parallelis a mucronibus glumarum quasi serratis, inferiores sæpe caudato-bracteatæ; rhachilla admodum compressa, subexalata. Glumæ naviculares, vix approximatæ, adpresso-imbricatæ, albovirides vix fusco-spadiceæ; nervi 9–13 per totam fere latitudinem glumæ sparsi. Stamina 3; antheræ muticæ vix apiculatæ, inclusæ; filamenta subpersistentia. Nux $\frac{1}{3}$ parte glumæ paullo longior, non apicata, nigra; cellulæ extimæ quadratæ, albidæ, persistentes.—Quoad magnitudinem quam plantæ tam spicularum variabilis: in forma Americana vulgari spiculæ minores; in India Orientali spiculæ interdum majores (forma "*pectiniformis*"), in exemplo Jacquemontiano late lanceolatæ, 6–7 mm. latæ.—*C. pec-*

tiniformis, Nees! var. *β* est exemplum caule 2 cm. longo, spiculis usque ad 45 cm. longis, 60-floris.—*Roem. et Sch. Syst. Mant.* ii. p. 128 quam nomen tam descriptionem *Roxburghii* mutaverunt; ideoque *C. pectiniformis*, Roem. et Sch., descriptio a *C. pectinato*, Roxb. abhorret.

Africa, Asia, America, in zonis tropicis et australibus.

Africa: Natal (*Gerard* n. 704, *h. Kew*); Zanzibar (*Kirk, h. Kew*; *Hildebrandt* n. 1072, *hh. Kew, Mus. Brit.*).

Madagascar (*Hildebrandt* n. 2920, *hh. Kew, Mus. Brit.*). Mauritius (*Sieber* n. 12, *hh. Kew, Mus. Brit.*). Seychelles (*Pervillé* n. 91, *h. Kew*). Socotra (*Balfour* n. 375, *h. propr.*).

Asia australi-orientalis; in omni India, alt. 0–2000 metr., ab Himalaya usque ad Zeylaniam et Singapore, vulgaris: Cabul (*Griffith* n. 191, *h. Kew* n. 6183); Punjab (*T. Thomson, h. Kew*); Dehra Doon (*G. King, h. Calcutta*); Sikkim (*Treutler, h. Kew*); Oudh (*R. Thompson* n. 409, *h. Calcutta*); Assam (*Griffith* n. 1481, *h. Mus. Brit.*); Bengal (*Griffith, h. Kew* n. 6181); India centralis (*G. King, h. Calcutta*); Poonah (*Woodrow, h. Kew*); Madras Peninsula (*Wight* nn. 1814, 1815, *h. Kew*); Mangalore (*Hohenacker* n. 822, *h. Mus. Brit.*); Zeylania (*Thwaites, C. P.* n. 812, *hh. Kew, Mus. Brit., Calcutta*); Burma (*Griffith* n. 6181, *h. Calcutta*); Pegu (*Oates, h. Calcutta*); Singapore (*Kurz, h. Calcutta*; *Kunstler* n. 53, *h. Calcutta*).

[Forma *pectiniformis*.—Lucknow (*Bonavia* n. 238, *h. Calcutta*); Sikkim (*T. Anderson* n. 1341, *h. Calcutta*); Khasia (*Griffith* n. 167, *h. Calcutta*); Bengal (*Wallich* n. 3308 B, *h. Calcutta*); Chota Nagpore (*Wood, h. Calcutta*); Arracan (*Kurz, h. Calcutta*); Pegu (*Maclelland, h. Calcutta*).]

[Forma *pectiniformis, β*. Nees.—Pegu (*Maclelland, h. Calcutta*).]

Ins. Andaman (*Kurz, hh. Kew, Calcutta*).

Java (*Zollinger* n. 448, *h. Kew*; *Horsfield* n. 1058, *h. Mus. Brit.*).

Borneo (*Motley* n. 275, *h. Kew*).

China: Whampoa (*C. Wright* n. 556, *h. Kew*); Canton (*Sampson* n. 257, *h. Kew*).

Ins. Philippine (*Cuming* n. 546, *hh. Kew, Mus. Brit.*).

America calida, frequens: Florida (*Chapman, hh. Mus. Brit., Calcutta*); New Orleans (*Riddell, h. Kew*; *Drummond, h.*

Calcutta); Carolina (*Bosc, h. Mus. Brit.*=" C. amœnus, *Bosc*"); Ins. Bahama (*Brace* n. 365, *h. Kew*); Jamaica (*Purdie, h. Kew*); Martinique (*Husnot* n. 3, *hh. Kew, Mus. Brit.*); Porto Rico (*Wydler* n. 348, *h. Mus. Brit.*); Nicaragua (*Tate* n. 498, *hh. Kew, Mus. Brit.*); Chagres (*Fendler* n. 352, *h. Kew*); Venezuela (*Moritz* n. 681, *h. Kew*); Trinidad (*Fendler* n. 896, *h. Mus. Brit.*); Guiana Anglica (*Schomburgk* n. 882, *hh. Kew, Mus. Brit.*); Neo-Granada (*Schott* n. 13, *h. Mus. Brit.*); Cartagena (*Schott* n. 25, *h. Mus. Brit.*); Amazon Superior (*Traill* nn. 1171, 1172, *h. Kew*); Santarem (*Spruce* nn. 85, *h. Kew*); Brasil (*Burchell* nn. 1367, 6457, 6927, 9596, 9694, *h. Kew*).

56. C. LUCIDULUS (*Klein; Link, Jahrb.* iii. p. 86); luteo-viridis; umbella laxa, simplice vel composita; spiculis majusculis, spicatis; glumis remotis; nuce magna, ovoidea aut ellipsoidea, acuta, triquetra.—*Kunth, Enum.* ii. p. 61.

C. Zollingeri, *Steud.*! *in Zoll. Verz. Ind. Arch.* p. 62, *Cyp.* p. 17; *Boeck. in Linnæa*, xxxvi. p. 352.
C. tenuiculmis, *Boeck.*! *in Linnæa*, xxxvi. p. 286, *non in Flora*, 1879, p. 554.
C. Schweinfurthianus, *Boeck.*! *in Flora*, 1879, p. 553.
C. compressus, var., *Thwaites*! *Enum. Pl. Zeyl.* p. 342; *Herb. Ind. Or., Hook. f. et T. Thoms.*
C. rotundus, *Miq.*! *Fl. Ind. Bat. Suppl.* pp. 260, 600.
C. rotundus, var. carinalis, *Benth.*! *Fl. Austral.* vii. p. 280.
C. Wightii, *Hance*! *in Trimen Journ. Bot.* 1878, p. 14, *non Nees.*
Cyperus, *Wall.*! *List* n. 3321.
Cyperus, *Wall.*! *List* n. 3367.
Cyperacea indeterminata, *Wall. h.* n. 6.

Rhizoma breve, lignosum, horizontale, non crassum. Culmi solitarii aut 2–3ni, 2–6 dm. longi, tenues, trigoni, apice triquetri. Folia 3–4, angustiora, cum $\frac{2}{3}$ parte culmi sæpe æquilonga, parum scabra. Involucri bracteæ 3–4, usque ad 2–3 dm. longæ, patulæ. Umbellæ radii 4–8, inæquales, usque ad 2 dm. longi, rarius umbella contracta, imo capitata, visa est; radii tenues; ochreæ usque ad 2–4 cm. longæ, acutæ, interdum foliigeræ. Umbellulæ sæpius e spica simplice constantes, haud raro congestim corymbosæ, rarius evolutæ, radiolis 1–3 cm. longis. Spicæ rhachis 1–2 cm. longa, basi subnuda, 4–16-spiculosa. Spiculæ longæ 3 cm., latæ 4 mm., 20-floræ, compressæ, apice acutæ, inferiores sæpe caudato-bracteatæ; rhachilla angustissime hyalino-alata. Glumæ majusculæ, ovatæ, subobtusæ, compressæ vix carinatæ, in dorso viridi-5–7-nerviæ, in marginibus estriatæ scariosæ, rubro-maculatæ; margines primum imbricati, proventu autem liberi nucem amplectentes. Stamina 3, subinclusa; antheræ lineari-oblongæ, muticæ. Stylus nuce multo brevior; rami 3, e gluma breviter exserti. Nux cum $\frac{2}{3}$ parte glumæ æquilonga, nigra; cellulæ extimæ quadratæ, hyalinæ persistentes.—Hæc species (si non *C. lucidulus*, Link) est *C. lucidulus*, Klein, in Kunth, nomen cæteris veterius.

Africa tropicalis, India, China, Malaya, and Australia.

Africa: Gaboon flumen (*Soyaux* n. 355, *h. Kew*); Niger flumen (*Barter* n. 1573, *h. Kew*); Abbeokuta (*Irving*, *h. Kew*); Djur (*Schweinfurth* n. 2318, *h. Kew*).

India orientalis, alt. 0–1600 metr., a Nepaul usque ad Singapore: Nepaul (*Wallich* nn. 3321, 3367, *hh. propr.*, *Calcutta*); Assam (*Jenkins* n. 696, *h. Calcutta*); Suddiya (*Griffith*, *h. Calcutta*); Khasia, Mansmai, alt. 1200 metr. (*C. B. Clarke* n. 16188); Bengalia or. (*Griffith* n. 1601, *h. Kew*, n. 6210, *h. Calcutta*); Pundua (*J. D. Hooker* n. 360, *h. Kew*); Bhotan (*C. B. Clarke* n. 18529, *h. Kew*); Bengalia, Comilla, Sylhet, &c. (*C. B. Clarke* nn. 7124, 16193, 19146, 24995, &c.); Chittagong colles (*Wood*, *h. Calcutta*); Montes Anamallay, alt. 1600 metr. (*Beddome*, *h. propr.*); Zeylania (*Thwaites*, *C. P.* n. 800 partim *h. Kew*, n. 807 *hh. Mus. Brit.*, *Calcutta*); Malacca (*Griffith*, *h. Kew n.* 6209); Siam (*Lebœuf* n. 589, *h. Kew*); Singapore (*Kurz*, *h. Calcutta*).

China: Whampoa (*Hance* n. 19480, *h. Calcutta*); Hongkong (*C. Wright* n. 560, *h. Kew*).

Java: Buitenzorg (*Kurz* n. 1885, *h. Calcutta*) (*Zollinger* n. 2689, *h. Mus. Brit.*; *Horsfield*, *h. Mus. Brit.*).

Bangka (*Amand*, *h. Kew*).

Borneo (*Barber* n. 305, *h. Kew*; *Motley* n. 90, *h. Kew*).

Australia: sinus Rockingham (*Dallachy*, *h. Kew*; *O'Shaughnesy*, *h. Kew*).

57. C. RADIANS (*Nees et Meyen in Linnæa*, ix. p. 285, nomen nudum, *in Pl. Meyen.* p. 63); caule brevi; umbella specie simplice radiis longissimis; spicis globosis, multispiculosis, pluribracteolatis; spiculis compressis; glumis navicularibus, laxiuscule imbricatis, acutis submucronatis.—*Boeck. in Linnæa*, XXXV. p. 515 partim (?); *non Benth.*

C. radicans, *Kunth, Enum.* ii. p. 95 (errore typogr.).

Radix fibrosa; culmus 2–3 cm. Folia 2–3, usque ad 5–8 cm. longa, 2–4 mm. lata, scabra. Umbellæ radii 4–8, usque ad 8–12 cm. longi; ochreæ 1–2 cm. longæ, castaneæ, truncatæ aut spathaceæ. Umbellulæ (capitula) 8–15-spiculosæ; involucelli bracteæ 3–4, usque ad 8–12 mm. longæ. Spiculæ longæ 12 mm., latæ 3–4 mm., 10–16-floræ; rhachilla subexalata; glumæ imæ spicularum inconspicuæ. Glumæ ovatæ, in dorso late virides 5–9-nervosæ, in lateribus sanguineo-fuscæ obscurius striatæ. Stamina 2–3; antheræ anguste oblongæ, muticæ, rubræ. Stylus nuce brevior; rami 3, e gluma breviter exserti. Nux ½ partem glumæ superans, ellipsoidea, utrinque acuta, triquetra, nigra; cellulæ extimæ quadratæ, hyalinæ, lucidæ, persistentes.

In oris Burmæ australis (*Kurz, h. Calcutta*).

58. C. GRIFFITHII (*Steud. Cyp.* p. 316); caule brevi; umbella composita, radiis longissimis; spiculis 1–5nis fasciculatis, teretibus, turgide lanceolatis; involucellis longis, erectis; glumis late ovatis, spinelloso-mucronatis, multistriatis.

C. radians, *Benth. Fl. Hongk.* p. 386; *Boeck. in Linnæa,* xxxv. p. 515, partim.

C. macropus, *Miq. Fl. Ind. Bat. Suppl.* p. 599?

Cyperus, *Wall.! List* n. 3371, B partim.

Radix fibrosa. Culmi cæspitosi, robustiores, modo abbreviati 1–5 cm. longi, modo 10–15 cm. Folia 2–5, culmum superantia, plana, carinata, fere levia. Umbellæ radii 3–11, longissimi, in forma etiam subacauli usque ad 35 cm. aliquando elongati, in exemplis evolutis iterum umbellatim divisi; involucri bracteæ 3–7, latæ 8 mm., patenti-erectæ, cum umbella subæquilongæ; ochreæ 1–2 cm. longæ, longiuscule 2-dentatæ; umbellulæ 3–6-radiatæ, radioli usque ad 4–15 cm. longi, bracteæ numerosæ, foliæformes, cum umbellulis subæquilongæ. Spicæ ipsæ multibracteatæ, sæpe 1–pauci-spiculosæ; bracteolæ paullo distantes, 1–2 cm. longæ, corymbosæ (*i. e.* spicæ revera compositæ). Spiculæ radiatim digitatæ, longæ 12 mm., latæ 4 mm., vix obscure compressæ, 6–12-floræ; rhachilla excavata, subexalata; glumæ 2 imæ minores, vacuæ, bracteæformes, conspicuæ. Glumæ remotiusculæ sed spissæ, per margines (fructus tempore maturi) sese late arcte integentes, in dorso rotundatæ apicem versus carinatæ, mucrone valido curvato excurrente, pallide brunneæ aut subcastaneæ; nervi 10–18 per totam fere latitudinem glumæ

sparsi, sæpius brunnei. Stamina (nisi in exemplis parvulis) 3; filamenta persistentia; antheræ oblongæ, muticæ, rubræ. Stylus nuce fere brevior; rami 3, e gluma breviter exserti. Nux ellipsoidea, subobtusa, acute triquetra, cum $\frac{1}{3}$ parte glumæ æquilonga, nigra; cellulæ extimæ quadratæ, marcescentes, lucide albidæ, hyalinæ, non porosæ.

Asia australi-orientalis.

Malacca (*Griffith, h. Kew*; *Maingay* nn. 2987, 3191, *h. Kew* n. 1721).

Tenasserim (*Helfer, h. Kew* n. 6209).

Singapore (*Wallich, h. Linn. Soc.*, n. 3371 B *h. Calcutta*).

China: Macao (*Hance n.* 10135, *h. Kew*); Hongkong (*C. Wright* n. 565, *h. Kew*).

Cochinchina (*Lebœuf* n. 832, *h. Kew*).

Bangka (*Teysmann, h. Kew*).

Borneo: Banjermassing (*Motley* nn. 55, 1135, *h. Kew*); Sarawak (*Beccari* n. 3686; *Barber, h. Kew*).

I am completely puzzled by this plant. When I took up the bundle of *C. radians* at Kew, it contained a large number of specimens, from which I compiled the description here given of *C. Griffithii*, and also extracted the select localities here quoted for *C. Griffithii*. The plant differed from all other Cyperi I had then seen by the very short culms and enormously long rays. Nothing caused me to suspect more than one species in the bundle; I feel sure that nearly all of it was the plant here described as *C. Griffithii*, though it is possible I may have hastily overlooked some specimens of true *C. radians*; the marked character of the short culm might seduce any one into hastily naming a specimen on that obvious point *without looking further*. But at Kew I was quite at a loss to imagine how Boeckeler had got the species among the Compressi; the spikelets are so terete that I can compare them in that respect with nothing except *C. canescens*, Vahl. In the Calcutta Herbarium, however, I find Kurz's Burmese excellent specimens, also with short culm, very long rays, though with totally different spikelets, exceedingly like those of *C. compressus*. I might think it a trick of memory; but, as the Calcutta Herbarium also has an excellent specimen of *C. Griffithii*, I see by placing the two side by side that, though both have very short culm, very long rays, the spikelets are as different as well can be in *Cyperus*; and on further examination the two are found to differ widely in the glumes, inflorescence, bracts, in short at every point.

I assume here in Calcutta two things—1st, that Kunth's *C. radicans* is certainly Nees's *radians*; Kunth has marked it v. s.; his description, "squamis navicularibus, multinerviis," as well as of the simple umbel, "capitulis subglobosis polystachyis," proves that he had before him Kurz's plant, and not the Kew-bundle *C. radians.* Secondly, it is clear that Boeckeler must have had this plant in his mind, and not the Kew-bundle plant, when he placed his *C. radians* in sect. Compressi. But from Boeckeler's quoting Griffith's Malacca collection for *C. radians*, it would appear that Boeckeler has, from the striking character of short culm, very long ray, rolled the two into one despite the other enormous differences.

We have in *Cyperus* numerous instances of the same peculiar type of inflorescence turning up in very different parts of the genus, as *C. cephalotes, pygmæus, dubius*, confused much by the old authors. At the same time it seems so very improbable that, over exactly the same area, *two* species both having the strange habit of *C. radians* should be found, that I have imagined the possibility of *C. Griffithii* being a monstrous or semi-bisexual state of *C. radians.* (Very curious differences in the structure of the spikelets accompany some such state among the sect. Elegantes.) But both *C. radians* and *C. Griffithii* appear perfectly normal with ripe nuts; if they are one species, I do not know why *C. canescens* may not be a state of *C. compressus.* I give the matter up for the present.

59. C. SCHWEINITZII (*Torrey in Ann. Lyceum New York*, iii. p. 276); bracteis erecto-adpressis, umbellam simplicem laxam paullo superantibus; spiculis majusculis, antice fastigiato-spicatis; glumis distantibus, ovatis, mucronatis, striatis; nuce magna, triquetra.—*Boeck. in Linnæa*, xxxv. p. 518.

Rhizoma repens, lignosum. Culmi 3–5 dm. longi, apice triquetri spinuloso-scabri. Spiculæ longæ 15 mm., latæ 4 mm., 10–16-floræ.

Chicago (*Babcock, h. Calcutta*).

60. C. CONFERTUS (*Swartz, Prod.* p. 20, *Fl. Ind. Occ.* i. p. 115); debilis, fusco-viridis; umbella simplice; spicis breviter spicatis, 6–9-floris; glumis carinatis, in dorso viridi-7-nerviis, in lateribus fuscis vix luteis.—*Boeck. in Linnæa*, xxxv. p. 514.

Columbia, &c. (*fide Boeckeler*).

61. C. GLABER (*Linn. Mant.* p. 179); umbella specie simplice, congesta vel contracta; spiculis numerosis, capitato-spicatis, longis, multifloris, compressis; staminibus 3; nuce cum $\frac{1}{2}$–$\frac{2}{3}$ parte glumæ æquilonga, obovoidea, trigona, apice brevissime rostrata.—*Boeck. in Linnæa,* xxxv. p. 516.

C. patulus, *Kitaib. in Host, Gram.* iii. p. 49, t. 74; *Kunth, Enum.* ii. p. 24.

C. fuscus, var. virescens, *Kunth, Enum.* ii. p. 38, *nec* C. virescens, *Hoffm.*

C. erythræus, *Kunth, Enum.* ii. p. 27, *non Schrad.* (*fide Boeck.*).

Glumæ ovatæ, obtusæ, submucronatæ, in dorso late virides 5–7-nerviæ, in lateribus anguste rubro-striatæ, in marginibus scariosæ. Stamina 3; filamenta fere levia; antheræ lineari-oblongæ flavidæ, a crista parva, subquadrata, coccinea cristatæ.

Sicilia (*Todaro, h. Calcutta*).
Ischia (*Bentham, h. Calcutta*).
Tauria (*h. Calcutta*).
Iberia (*Wilhelms, h. Calcutta*).

62. C. RUBICUNDUS (*Vahl, Enum.* ii. p. 308); umbella capitata; spiculis majusculis, compressis, oblongis, rubicundis vel cinnamomeis; involucri bracteis 2–3, capitulum æquantibus vel duplo superantibus; nuce obovoidea aut late ellipsoidea, quam $\frac{1}{3}$ pars glumæ breviore.—*Kunth, Enum.* ii. p. 49; *Webb et Berth. Iles Canaries, Phyt.* iii. p. 361, t. 240 (nuce nimis elongata, acuta); *Boeck. in Linnæa,* xxxv. p. 507.

C. pectinatus, *Roxb.*! *Fl. Ind.* i. p. 190, *non Vahl.*

C. Teneriffæ, *Poir. Encyc.* vii. p. 245; *Roem. et Sch. Syst.* ii. p. 209; *Nees in Linnæa,* x. p. 131 (?).

C. coromandelinus, *Spreng. Syst.* i. p. 217, *non Boeck.*

C. Wightii, *Nees*! *in Wight Contrib.* p. 78; *Kunth, Enum.* ii. p. 99; *Boeck. in Linnæa,* xxxv. p. 507.

C. Serra, *A. Rich.*! *Fl. Abyss.* ii. p. 479.

C. petræus, *Hochst. in Hohenack.* n. 1293.

C. nitens, *Rottler in h. propr., non Vahl.*

Cyperus, *Wall.*! *List* n. 3314 B, A partim.

Radix annua, fibrosa. Culmi 1–2 dm. longi, cæspitosi, basi sæpe incrassati, sursum trigoni, leves. Folia 2–3, anguste graminea, sæpius culmo multo breviora, vel (in exemplo typico Neesiano *C. Wightii*) longiora; vaginæ sæpe majusculæ, laxæ. Involucri bracteæ usque ad 2–5 cm. longæ, sæpius capitulum parum superantes, patulæ. Spiculæ 4–15, longæ 23 mm., latæ

4–6 mm., vel in forma *C. Wightii* minores, admodum compressæ, lateribus parallelis; rhachilla subexalata. Glumæ ovatæ, acuminatæ, mucronatæ, naviculares, carinatæ, 9–13-nerviæ; nervi rubicundi aut pallide brunnei per totam fere latitudinem glumæ sparsi; latera læte rubicunda, aut sæpius pallidiora. Stamina 3; filamenta persistentia; antheræ oblongæ fere multicæ. Stylus nuce longior; rami 3, e gluma paullo exserti. Nux in planta indica late obovoidea, obtusa, triquetra, in planta canariensi paullo elongata ellipsoidea (nec conico-acutata), atro-fusca; cellulæ extimæ quadratæ, lucide albidæ, persistentes.—Hujus speciei nomen forsan antiquissimum *certum* est *C. Teneriffæ*; Vahl suum *C. rubicundum* a Porto Rico receperat; *C. rubicundus* autem Kunth in Orbe Nova adhuc non reperta est.

Teneriffe (*Bourgeau* nn. 463, 1566, *h. Kew*, n. 463, *h. Mus. Brit.*; *&c.*).

Africa australis (*H. Barkly* n. 5812, *h. Kew*).

Africa tropica: Ukamba (*Hildebrandt* n. 2658, *h. Kew*).

Abyssinia (*Schimper* nn. 603, 2340, *nec* 183, *h. Kew*, n. 2340 *h. Mus. Brit.*).

Socotra (*Balfour* n. 106, *h. propr.*).

Madras peninsula (*Wight* nn. 10, 1817, *h. Kew*); Carnatic (*G. Thomson, h. Calcutta*); montes Khoonda (*Hohenacker* n. 1293, *hh. Kew, Mus. Brit.*).

Sect. C. *Platystachyi.*

Platystachyi, *Kunth, Enum.* ii. p. 44 (*C. arenario* addito).—Compressi partim, *Boeck. in Linnæa*, xxxv. p. 505 (sp. aliis additis).—Sorostachys, *Steud. Cyp.* p. 71 (genus).

Rhizoma lignosum (nisi *C. leucocephalus*). Culmi foliati. Umbella congesta aut capitata. Spiculæ admodum compressæ, spississimæ, stramineæ aut cinnamomeæ. Glumæ ovatæ, subobtusæ, multinerviæ. Stamina 3 (1 in *C. leucocephalo*); filamenta mediocriter ligulata; antheræ lineari-oblongæ, muticæ. Nux cum $\frac{1}{3}$–$\frac{1}{2}$ partæ glumæ æquilonga, obovoidea, obtusa, trigona aut triquetra, interdum inæqualis a dorso compressa.

This group consists of very similar species easily recognized by the subcapitate inflorescence and the colour. The next group, *Bobartia*, differs in the woolly roots, the very broad ligulate filaments, and very rigid leaves. It might be more convenient to throw these two small groups into one, distinguished sufficiently by the pale colour and subcapitate inflorescence, and divide it into two subsections, one with woolly roots, one with non-woolly.

63. C. ARENARIUS (*Retz. Obs.* iv. p. 9); culmis in rhizomate repente diviso solitariis, distantibus, apice ipso subteretibus; umbella capitata aut breviradiata; involucri bracteis 2–3, altera multo longiore, suberecta; spiculis majusculis, latis, stramineo-brunneis; nuce obovoidea, a dorso compressa, inæquali, fusco-nigra.—*Nees in Wight Obs.* p. 77; *Kunth, Enum.* ii. p. 46; *Dalz. & Gibs. Bomb. Fl.* p. 284; *Boeck. in Linnæa,* xxxv. p. 536.

C. persicus, *Boiss. Diagn.* 1 ser. xiii. p. 39.

C. conglomeratus, var. γ, *Cosson, Expl. Algér., Bot.* iii. p. 245; *Boiss. Fl. Orient.* v. p. 369, *non Rottb.*

C. lævigatus, *Koenig et Roxb. MSS. in Mus. Brit., non Linn.*

Cyperus, *Wall.*! *List* n. 3314, A partim.

Cyperus, *Wall.*! *List* n. 3535.

Scirpus, *Wall.*! *List* n. 3460.

Rhizoma elongatum, repens, tenue, lignescens, a vaginis aureo-castaneis intectum, dichotome ramosum. Culmi remoti, solitarii, ima basi in rhizoma attenuati, 1–2 dm. longi, sæpe crassiusculi. Folia 2–5, cum culmo fere æquilonga, crassiuscula, in sicco curvata, marginibus involutis. Involucri bracteæ sæpissime 2; altera usque ad 4–8 cm. longa, quasi culmum producens, basi non dilatata (fructus tempore autem interdum divaricata), altera multo minor. Umbella 3–4-radiata, radiis usque ad 8–15 mm. longis, 3–7-spiculigeris, aut sæpius subcapitata. Spiculæ longæ 15 mm., latæ 5–8 mm., late lanceolatæ, compressæ, 10–16-floræ; rhachilla subexalata. Glumæ dense stipatæ, spissæ, concavæ vix carinatæ, late ellipticæ, obtusæ aut obsoleto-mucronatæ, stramineæ, per totam fere latitudinem a nervis 9–15 pallide brunneis longitudinaliter percursæ, in marginibus stramineo-hyalinæ. Stamina 3; filamenta ligulata, persistentia; antheræ majusculæ, lineari-oblongæ, muticæ, e gluma breviter exsertæ. Stylus nuce multo brevior; rami 3, e gluma exserti. Nux cum $\frac{1}{4}$–$\frac{1}{3}$ parte glumæ æquilonga, obtusa, in facie interiore subconcava, in dorso convexo curvato obtuse angulata nec carinata; cellulæ extimæ quadratæ, hyalinæ, persistentes.

In oris Indiæ a Bengalia usque ad Zeylaniam et Sinum Persicum.

Orissa (*W. S. Atkinson, h. Kew*).

Carnatic (*Wight* n. 2920, *h. Calcutta*; *G. Thomson, h. Calcutta*).

Madras (*Wight* n. 1816, *hh. Kew, Mus. Brit.* n. 2389 *h. Mus. Brit.*).
Zeylania (*Thwaites C. P.* n. 798, *hh. Kew, Mus. Brit.*).
Bombay (*Dalzell, h. Kew*).
Marwar: Mallarree (*G. King, h. Calcutta*).
Scinde (*Stocks, h. Kew*; *Dalzell, h. Calcutta*).
Sinus Persicus: ins. Karek (*Kotschy* n. 5, *hh. Kew, Mus. Brit.*).
Persia australis (*Aucher* n. 5483, *h. Kew, non* n. 5483 *h. Paris*).
Ava (*Wallich* n. 3535, *h. Calcutta*).

64. C. LEUCOCEPHALUS (*Retz. Obs.* v. p. 11); culmis cæspitosis, basi bulboso-incrassatis; umbella capitata, globosa, parva; involucri bracteis 3, divaricato-deflexis; spiculis lanceolatis, compressis, multifloris; glumis elliptico-oblongis, obtusis, albidis aut cinnamomeo-brunneis; nuce cum $\frac{1}{2}$ parte glumæ æquilonga, ellipsoidea, trigona.—*Boeck. in Linnæa*, xxxv. p. 590, *non Hassk.*

C. pulchellus, *R. Br. Prod.* p. 213; *Kunth, Enum.* ii. p. 110; *Benth. Fl. Austral.* vii. p. 265.
C. Schomburgkianus, *Nees! in Hook. Journ. Bot.* ii. (1840) p. 323, *in Mart. Brasil., Cyp.* p. 18; *Boeck. in Linnæa,* xxxv. p. 589.
C. sorostachys, *Boeck. in Linnæa,* xxxv. p. 588.
Sorostachys kyllingioides, *Steud. Cyp.* p. 71.
Lipocarpha, *Wall.! List* n. 3445, D.
Cyperus sp. n. 25, *Wall. h. propr.* (n. 3536 bis).
Cyperus sp. n. 46, *Herb. Ind. Or., Hook. f. et T. Thoms.*

Radix fibrosa; vel interdum (fide Boeckeler) rhizoma obliquum. Culmi 8–18 cm. longi, graciliores, trigoni. Folia 2–3, cum culmo sæpe æquilonga, angusta. Involucri bracteæ usque ad 3–10 cm. longæ. Capitulum 5–10 mm. in diam., densum. Spiculæ longæ 5–9 mm., latæ 2–3 mm., 10–18-floræ; rhachilla subexalata. Glumæ concavæ, marginibus involutis, vix carinatæ, in dorso obscurius 1–3-nerviæ, in lateribus enerviæ, scariosæ. Stamen 1, subinclusum; filamentum scabrum; anthera oblonga, mutica. Stylus brevis; rami 3, e gluma vix exserti. Nux obtusiuscula, nigra; cellulæ extimæ quadratæ, albidæ, emarcidæ, reticulatæ.—Spiculæ (cum glumis) iis *C. nivei* simillimæ sed multo minores.

India orientalis, late sparsa nec vulgaris: Behar, Monghyr (*Buchanan-Hamilton, h. Wall. propr.*); Bengal, Burrakur (*Kurz, h. Calcutta*); Canara et Mysore (*Law, hh. Kew, Mus. Brit.*); Malabar (*Stocks, h. Calcutta*); Pegu (*Kurz* n. 647, *h. Calcutta*); Moulmein (*R. Scott, h. Calcutta*); Tenasserim

(*Helfer* n. 6247/1, *hh. Kew, Calcutta*); Amherst (*Wallich, h. propr.*).

Ins. Philippine (*Cuming* n. 1417, *hh. Kew, Mus. Brit.*).

Australia tropicalis (*R. Brown* n. 5917, *hh. Kew, Mus. Brit.*); Queensland, Rockhampton (*Amalia Dietrich* n. 600, *h. Mus. Brit.*).

Brasil (*Burchell* nn. 8186, 8267, *h. Kew*).

Guiana Anglica (*Schomburgk* n. 810, *h. Kew*).

Kunth describes (Enum. ii. p. 44) *C. coronarius* from Bengal, which he says was *Scirpus coronarius*, Vahl, Enum. ii. p. 261, *et herb.*, from which I infer Kunth had Vahl's specimen; and he says the style was 3-fid (not 2-fid as Vahl), which he would only have said from a dissection of Vahl's plant. There is no Bengal plant under this name in the English herbaria nor in Calcutta; nor is there any Bengal plant that will answer the description except *C. niveus*, which common species Kunth knew too well to describe over again under the name *C. coronarius*. *C. coronarius* might be *C. leucocephalus*, which has sometimes (*fide* Boeckeler) "rhizoma obliquum."

65. C. NIVEUS (*Retz. Obs.* v. p. 12); culmis in apice rhizomatis repentis obliqui dense uniseriatim stipatis, incrassatis, apice ipso trigonis; umbella capitata; spiculis majusculis, compressis, albidis aut cinnamomeis; nuce late obovoidea, obtusissima, acute subæqualiter triquetra, faciebus 3 subconcavis.—*Roxb. Fl. Ind.* i. p. 191; *Nees in Wight Contrib.* p. 78; *Kunth, Enum.* ii. p. 45; *Boeck. in Linnæa*, xxxv. p. 530 (*non in Flora*, 1879, p. 550).

Cyperus, *Wall.*! *List* n. 3377.

Rhizoma lignosum, tenuius. Culmi 1–5 dm. longi. Folia 3–6, cum ½ parte culmi æquilonga, vel abbreviata, marginibus in sicco involutis. Involucri bracteæ sæpissime 2, longæ 2–6 cm., deflexo-patentes, basi non dilatatæ. Spiculæ 3–15, usque ad 2 cm. longæ, 6 mm. latæ, 20–40-floræ, admodum compressæ, utrinque angustatæ; rhachilla exalata. Glumæ dense imbricatæ, spissæ, ovatæ, obtusæ, compressæ, in dorso concoloriter 1-nerviæ, in lateribus plicatim multistriatæ. Stamina 3; filamenta anguste ligulata, persistentia; antheræ lineari-oblongæ, muticæ, e gluma vix exsertæ. Stylus nuce brevior; rami 3, e gluma breviter exserti. Nux cum ⅓ parte glumæ æquilonga, in apice truncata, subdepressa, nigra; cellulæ extimæ quadratæ, albidæ, hyalinæ, detergibiles (*i. e.* "nux reticulatim albo-velata").

In omni India orientali cum Burma; a Zelania nondum recepta.

Montes Suleiman (*Sanders* n. 9, *h. Calcutta*).

Beloochistan (*Stocks* n. 617, *h. Kew*).

Kashmir (*W. S. Atkinson* n. 24917, *h. Kew*).

Punjab (*Jacquemont* n. 951, *h. Kew*; *Stewart* nn. 289, 383, 782, &c.).

Kumaon, alt. 2000 metr. (*Strachey et Winterbottom* n. 4, *h. Kew*).

Simla, alt. 2000 metr. (*G. King, h. Calcutta*, exemplum macrum).

Kulu, alt. 2000 metr. prope Rotang Pass (*Stoliczka, h. Calcutta*).

Panwi, alt. 2400 metr. prope Bursahir (*Brandis, h. Calcutta*).

Kishtwar, usque ad 2500 metr. (*Stoliczka, h. Calcutta*).

Nepaul (*Wallich* n. 3377 B, *h. Calcutta*).

Sikkim (*J. D. Hooker, G. King h. Calcutta*).

Assam (*Griffith* n. 1610, *hh. Kew, Mus. Brit.*, n. 1467, *h. Mus. Brit.*; *Fisher, h. Calcutta*).

Bengal orientalis et Burma (*Griffith* nn. 6170, 6171, *hh. Kew, Calcutta*).

Bengalia septentrionalis occidentalisque, vulgaris (*C. B. Clarke &c.*).

Rajmahl et Raneegunje (*Kurz, h. Calcutta*).

Chota Nagpore (*Wood, h. Calcutta*).

Jodhpoor (*G. King, h. Calcutta*).

Awrungabad (*Hardwicke, h. Mus. Brit.*).

Madras peninsula (*Wight* n. 1818, *h. Kew*; *Campbell, h. Mus. Brit.*).

66. C. Atkinsoni; radicibus non lanosis; culmis cæspitosis, basi incrassatis, apice teretibus; umbella contracta; spiculis 3–7nis digitatis, linearibus, densifloris, pallide brunneis; nuce angustius obovoidea, trigona, a tergo vix compressa.

C. niveus, *hh. Royle et Stocks, non Retz.*

C. effusus, *h. Dalzell, non Rottb.*

Culmi in rhizomate lignoso 2–6ni, fasciculati, 10–16 cm. longi, inferne trigoni. Folia prope basin culmi plurima, cum culmo æquilonga aut sæpius multo breviora, rigida, in sicco curvata, marginibus involutis, obscurius scabris. Involucri bracteæ 2–3, altera usque ad 5–8 cm. longa, junior suberecta. Umbellæ radii

3–4, usque ad 1–3 cm. longi, vel umbella fere congesta. Spiculæ usque ad 18 mm. longæ, 4–5 mm. latæ, 20–30-floræ, admodum compressæ, lateribus fere parallelis; rhachilla subexalata. Glumæ spissæ, ovatæ, obtusiusculæ, breviter mucronatæ, naviculares, per totam fere latitudinem multistriatæ, nervis cinnamomeis. Stamina 3; filamenta ligulata, persistentia; antheræ lineares, muticæ. Stylus nuce subbrevior; rami 3, e gluma plane exserti. Nux $\frac{1}{3}$ parte glumæ longior, obtusa, in facie interiore vix concava, in dorso angulata nec carinata, fusco-castanea; cellulæ extimæ quadratæ, minutæ.—*C. niveo* affinis, sed *C. niveum* umbella radiata nondum visi.

India boreali-occidentalis (*Royle, h. Kew*); Punjab (*Clark* n. 142, *h. Calcutta*); Kashmir, Bhimbur (*Atkinson* n. 24196, *h. Kew*, speciei typus); Scinde, Kurrachee (*Stocks, h. Kew*; *Dalzell, h. Calcutta*); Bombay (*Dalzell, h. Kew*).

67. C. OBTUSIFLORUS (*Vahl, Enum.* ii. p. 308); culmis robustis; umbella capitata, c. 6-spiculosa; spiculis longis 16 mm., latis 8 mm., admodum compressis, spissis, albidis; glumis ellipticis, obtusis, striatis.—*Kunth, Enum.* ii. p. 45; *Boeck. in Linnæa*, xxxv. p. 528.

C. sphærocephalus, β. leucocephalus, ***Vahl, Enum.*** **ii. p. 308;** ***Kunth, Enum.*** **ii. p. 45.**

Natal (*Grant, h. Calcutta*); alt. 0–3000 metr. (*Sutherland, h. Calcutta*).

Var. β. *flavissima*, Boeck.; spiculis aureo-flavis.

C. flavissimus (sp.), ***Schrad. Anal. Fl. Cap., Cyp.*** **p. 5, t. 2. fig. 2.**

C. sphærocephalus, ***Vahl, Enum.*** **ii. p. 313;** ***Kunth, Enum.*** **ii. p. 45.**

Africa australis (*Burke, h. Calcutta*).

68. C. MARGARITACEUS (*Vahl, Enum.* ii. p. 307); culmo tenuiore; umbella capitata, c. 5-spiculosa; spiculis maximis, 20-floris, admodum compressis, lucidis, stramineis; glumis dense imbricatis, acute carinatis, 19-nerviis.—*Kunth, Enum.* ii. p. 46; *Boeck. in Linnæa*, xxxv. p. 529.

Niger flumen; Nupe (*Barter, h. Calcutta*).

Sect. D. *Bobartia.*

Bobartia, *Linn. Fl. Zeyl.* p. 17 (genus), *non Lam.*—Galilea, *Parl. Fl. Palerm.* i. p. 297 (genus).—Sect. Repentes, *Boeck. in Linnæa*, xxxv. p. 536 (C. arenario *excl.*; C. proteinolepide *incl.*).

Radices lanosi. Folia rigida. Umbella congesta aut capitata. Spiculæ spissæ, stramineæ aut pallide brunneæ. Glumæ ovatæ, obtusæ aut breviter mucronatæ. Stamina 3; filamenta late ligulata; antheræ majusculæ, lineari-oblongæ, muticæ. Nux cum $\frac{1}{4}$–$\frac{1}{2}$ parte glumæ æquilonga, obovoidea truncata, rarius ellipsoidea, inæqualiter trigona, in facie interiore plana vel concava, in dorso curvata, compressa; stylus 3-fidus.

The species of this small group are so closely allied that Cosson and Boissier unite several specifically with *C. conglomeratus*. The spikelets are less compressed than in the Platystachyi. The nut and style of *C. stoloniferus*, Retz., agree closely with this section, and it should perhaps be placed here; but the rhizome is nearer that of *C. rotundus*: it is, indeed, so continually mistaken, even by experienced botanists, for a form of *C. rotundus*, that it is more convenient to arrange it there whether that be its true affinity or not.

69. C. PACHYRRHIZUS (*Nees*; *Boeck. in Linnæa*, xxxv. p. 545); robusta, radicibus crasse lanosis; umbella contracta aut capitata; involucri bracteis 2–3, divaricatis; glumis ovatis, obtusis, minute mucronatis; nuce parva, contra rhachin compressa; stylo quam nux breviore, ramis 3 e gluma vix exsertis.

C. conglomeratus, *Thwaites, Enum. Pl. Zeyl.* p. 343.
C. leucocephalus, *Wight in h. propr.* n. 2381, *non Retz.*
— Bobartia, *Linn. Fl. Zeyl.* p. 17, *non Lam.*

Rhizoma longe repens, lignosum, tenuius, castaneo-brunneum. Culmi 1–3ni, longi 1–5 dm., basi multifoliati, castanei, apice crassi, trigoni, straminei. Folia cum culmo sæpe æquilonga, lenta, marginibus in sicco involutis. Involucri bracteæ usque ad 1–2 dm. longæ, foliis similes. Spicæ 3 cm. in diam., globosæ, densæ. Spiculæ 30–80, longæ 15 mm., latæ 5 mm., compressæ, lanceolatæ, 8–16-floræ; rhachilla subexalata. Glumæ pallidæ, concavæ non carinatæ, 7–11-nerviæ, lateribus latiusculis enerviis. Stamina 3; filamenta late ligulata; antheræ lineari-oblongæ, muticæ. Nux cum $\frac{1}{4}$–$\frac{1}{3}$ parte glumæ æquilonga.

Madras peninsula (*Wight* n. 2381, *hh. Kew, Mus. Brit.*, n. 105 *h. Mus. Brit.*); Concan australis (*Law, h. Kew*).
Zeylania (*Thwaites, C. P.* n. 808, *hh. Kew, Mus. Brit.*).
Ins. Laccadive (*Hume, hh. Kew, Calcutta*).

Var. *β. minor*; culmis minoribus.
Culmi approximati, basi subincrassati, quasicæspitosi, longi

8 cm., tenuiores. Folia plura, culmo subbreviora. Involucri bracteæ 3, divaricatæ, usque ad 25 mm. longæ. Capitulum globosum, 12-spiculosum. Spiculæ omnino *C. pachyrrhizi*. Stylus alte 3-fidus.

Aden (*Hunter* n. 13, *h. Kew*).

70. C. CONGLOMERATUS (*Rottb. Descr. et Ic.* p. 21, t. 15. fig. 7); radicibus lanosis; culmis crassiusculis, sursum teretibus; umbella simplice, contracta aut congesta; spiculis parum compressis, lineari-lanceolatis, viridi-stramineis aut cinnamomeo-brunneis, 8–16-floris; nuce obovoidea, trigona, a dorso subcompressa.—*Boeck. in Linnæa*, xxxv. p. 543; *Cosson, Expl. Algér., Bot.* iii. p. 243, pro majore parte; *Boiss. Fl. Orient.* v. p. 369, pro majore parte.

C. effusus, *Rottb. Descr. et Ic.* p. 22, t. 12. fig. 3; *Kunth, Enum.* ii. p. 47.

C. falcatus, *Boeck. in Linnæa*, xxxv. p. 545.

C. curvulus, *Boeck. in Linnæa*, xxxv. p. 541, partim.

Asia australi-occidentalis; Africa borealis et tropica.

Beloochistan (*Pierce, h. Kew*); Bolan Pass (*Griffith* nn. 43, 185, *h. Kew* n. 6146).

Sinus Persicus (*Kotschy* n. 20, *hh. Kew, Mus. Brit.*).

Aden (*Ralph* n. 666, *h. Mus. Brit.*; *T. Anderson, h. Calcutta*; *J. D. Hooker, h. Calcutta*; *King, h. Calcutta*; *Brandis* n. 2463, *h. Calcutta*; *Rod. Wiesner, h. Calcutta*).

Jeddah (*Schimper* n. 810, *h. Mus. Brit.*, n. 810 partim, forma *nana, h. Kew*; *Schweinfurth* n. 122, forma *nana, h. Mus. Brit.*).

Dongola (*Ehrenberg, h. Kew*).

Berber (*Schweinfurth* n. 645, *h. Kew*).

Nubian desert (*Petherick, h. Kew*).

Var. *β. major* (Boeck. in Linnæa, xxxv. p. 544); spiculis multo majoribus, longis 2 cm., latis 5 mm., 30-floris, glumis densissime stipatis.

C. densus, *R. Br.*! *in Salt. Abyss. Append.* p. 62, nomen nudum.

C. proteinolepidi fortasse affinior. In exemplo Thomsoni, spiculæ longæ 4 cm., 60-floræ.

Arabia (*Ehrenberg, h. Kew*; *Schimper* n. 301, *h. Mus. Brit.*); Aden (*T. Thomson, hh. Kew, Calcutta*).

Palestina (*Hayne, h. Kew*).

Egypt: Kosser (*Schweinfurth* n. 2015, *h. Mus. Brit.*).

Var. ? γ. *socotrensis*; humillima; spiculis multo angustioribus, anguste lanceolatis; glumis castaneo-luteis.

Culmi dense cæspitosi, 1–2 cm. longi, trigoni. Involucri bracteæ 2–4, vix 1 cm. longæ. Umbella e 2–5 spiculis capitata. Spiculæ longæ 1 cm., latæ 1–2 mm., 8–14-floræ.

Socotra (*Balfour* n. 27, *h. propr.*).

71. C. PROTEINOLEPIS (*Steud. Cyp.* p. 15); radicibus lanosis; culmis crassiusculis, sursum teretibus; umbella simplice, contracta aut capitata; spiculis compressis, lineari-oblongis, lateribus parallelis, griseis aut pallidis, 24–40-floris; nuce obovoidea contra rhachillam compressa.—*Boeck. in Linnæa*, xxxv. p. 522.

C. involutus, *R. Br.! in Salt Abyss., Append.* p. 62, nomen nudum.

C. curvulus, *Boeck. in Linnæa*, xxxv. p. 541 pro majore parte, *non Boeck. in Flora*, 1879, p. 549.

A *C. conglomerato* glumis obscure mucronatis, densius stipatis, vix sat diversa.

Arabia (*Schimper* nn. 301, 733, *h. Kew*).

Aden (*T. Thomson, h. Kew*; *Sir R. Schomburgk* n. 8, *h. Calcutta*).

Mare Rubrum (*Nimmo, h. Kew*).

Jeddah (*Schimper* n. 810 partim, *h. Kew*; *Fischer*, n. 55, *h. Kew*; *Zohrab* n. 13 partim, *h. Kew*).

Abyssinia (*Salt, h. Mus. Brit.*).

Socotra (*Balfour* n. 105, *h. propr.*).

72. C. PUNGENS (*Boeck. in Linnæa*, xxxv. p. 537); radicibus lanosis; culmis crassis, sursum teretibus; umbella simplice, contracta aut capitata; spiculis compressis, lineari-lanceolatis, lucide stramineis, 10–18-floris; nuce magna, obovoidea, contra rhachillam multum compressa.

C. conglomeratus, *Decaisne, Fl. Sinai*, p. 13; *Cosson, Expl. Algér., Bot.* iii. p. 243; *Boiss. Fl. Orient.* v. p. 369 partim.

A *C. conglomerato* videtur sat diversa; a *C. pachyrrhizo* differt capitulis magis lucidis minus densis, nuce duplo longiore.

Africa: Egypt (*Schweinfurth* n. 426, *h. Kew*; *Aucher* n. 3794, *h. Kew*); Algeria (*Balansa* n. 944, *hh. Kew, Mus. Brit.*; *Bourgeau* n. 22, *h. Kew*); Sinai (*Bové* n. 28, *h. Kew*).

73. C. AUCHERI (*Jaub. et Spach, Ill. Pl. Or.* t. 101); radicibus lanosis; culmis crassiusculis, sursum teretibus; umbella simplice pauciradiata aut capitata; spiculis magnis, compressis, late

linearibus, lucide stramineis aut albidis, 20–40-floris; nuce majuscula, obovoidea, a dorso compressa.

C. conglomeratus, *Cosson, Expl. Algér.*, *Bot.* iii. p. 243; *Boiss. Fl. Orient.* v. p. 369.

Spiculæ longæ 20–45 mm., latæ 6–8 mm.—Exempla optima Vogelii (quam illa a Jaub. et Spach depicta) paullo majora.

Persia australis (*Aucher* n. 5483, *h. Kew*).
Egypt (*Aucher-Eloy, h. Calcutta*).
Soudan, Agadem (*Vogel, h. Kew*).
Deserta Belbeys (*Schubert, h. Kew*).

74. C. ÆGYPTIACUS (*Gloxin. Obs.* p. 20, t. 3); radicibus lanosis; umbella capitata vel congesta; glumis maximis, aristatis, per totam fere latitudinem 11-nervosis; nuce ellipsoidea subobovoidea, a dorso compressa.—*Kunth, Enum.* ii. p. 48; *Boeck. in Linnæa*, xxxv. p. 541.

Schœnus mucronatus, *Linn. Sp. Pl.* p. 63.
Mariscus mucronatus, *Presl*; *Sibth. Fl. Græc.* t. 43.
Galilea mucronata, *Parlat. Giorn. Bot.* ii. p. 134.

Ins. Canaries (*Lemann, h. Calcutta*).
Lisbon (*Daveau, h. Calcutta*).
Montpellier (*Bentham, h. Calcutta*).
Athenæ (*Heldreich, h. Calcutta*).
Ins. Rhodes (*Aucher-Eloy, h. Calcutta*).

Sect. E. *Viscosi.*

Sulcati *seu* Glutinosi, *Boeck. in Linnæa*, xxxv. p. 547.

Radix fibrosa. Culmi obscurius viscoso-puberuli. Folia angusta, involuta, rigidiora. Umbella composita. Glumæ ovatæ, naviculares, mucrone breviter excurrente. Stamina 3; antheræ lineari-oblongæ, muticæ. Nux trigona, ellipsoidea aut sublanceolata.

This group, of three species only in Boeckeler, is held together by trivial characters, while the two species below enumerated are unlike in habit. *C. viscosus* itself seems near *C. elegans*, where Kunth placed it, differing in the narrow leaves. *C. oxylepis* is like no other species known to me.

75. C. VISCOSUS (*Aiton, Hort. Kew.* i. p. 59); umbella laxa, irregulari, spiculis fasciculatis; nuce cum ½ parte glumæ æquilonga, obovoidea, triquetra.—*Kunth, Enum.* ii. p. 28; *Boeck. in Linnæa*, xxxv. p. 547.

Exemplum in h. Calcutta (in Galapagos Archip., Ins. Charles a Goodridge lectum) e Kew sub nomine *C. rubiginoso*, Hook. f., emissum videtur=*C. viscosus*.

India occidentalis; Mexico.

76. C. OXYLEPIS (*Nees*; *Steud. Cyp.* p. 25); viscosulus; umbella fere simplice, densiuscula; spiculis dense fasciculatis, luteobrunneis; glumis laxe imbricatis, plicato-striatis; nuce oblonga, rostrata, cum $\frac{3}{4}$ parte glumæ æquilonga.—*Boeck. in Linnæa*, xxxv. p. 549.

Demerara (*h. Calcutta*, n. 324).

Sect. F. *Luzuloidei.*

Luzuloidei, *Kunth, Enum.* ii. p. 39; *Boeck. in Linnæa*, xxxv. p. 549 (C. silletensi *excl.*).

Radix fibrosa (in *C. reflexo* rhizoma lignosum). Folia longiuscula. Umbella composita (aut decomposita); umbellulæ haud raro capitatim congestæ. Spiculæ multifloræ, multum compressæ; rhachilla obscurius alata. Glumæ concavæ, obtusæ. Stamen 1 (in *C. Lechleri* 3); antheræ oblongæ, muticæ. Nux trigona, obovoidea aut oblonga, apice breviter vel longius acutata.—Americani.

This is a very natural small group, of which only some characteristic species are taken up here. The Indian *C. silletensis*, included among Luzuloidei by Boeckeler, appears to me to differ considerably, and is exceedingly near *C. pulcherrimus*, Willd. Kunth included here *C. platystylis*, R. Br. (under the name *C. pallidus*), probably because he had no better place to put it, and objected to making a section of a solitary species out of it, as I have done as the lesser evil.

77. C. VEGETUS (*Willd. Sp. Pl.* i. p. 283); culmo sursum trigono, levi; umbella 5–6-radiata; umbellulis globosis, capitatis 10–50-spiculosis; glumis lutescentibus aut virescentibus; nuce cum $\frac{1}{2}$–$\frac{2}{3}$ parte glumæ æquilonga, triquetra, obovoidea, breviter rostrata.—*Boeck. in Linnæa*, xxxv. p. 550.

Kunth's statement (Enum. ii. p. 40) that the nut is only $\frac{1}{3}$–$\frac{1}{2}$ the length of the glume is misleading.

Valdivia (*Philippi* n. 544, *h. Calcutta*).

Juan Fernandez (*Scanlin, h. Calcutta*).

78. C. DRUMMONDII (*Hook. et Torrey in Ann. Lyceum New York*, iii. p. 437) ; culmo sursum triquetro, scabro ; umbella 5–6-radiata ; umbellulis globosis, 30–40-spiculosis ; glumis luteo-brunneis aut fuscescentibus ; nuce cum $\frac{1}{2}$–$\frac{2}{3}$ parte glumæ æquilonga, trigona, apice breviter acutata, basi conspicue stipitata.—*Boeck. in Linnæa*, xxxv. p. 552.

C. distinctus, *Steud. Cyp.* p. 24.

Texas (*Drummond* n. 449, *h. Calcutta*).

79. C. VIRENS (*Mich. Fl. Amer.-Bor.* i. p. 29) ; umbella specie composita, spicis globosis, multispiculosis ; spiculis 30–40-floris, lutescentibus ; nuce cum $\frac{1}{2}$–$\frac{2}{3}$ parte glumæ æquilonga, angusta, apice acuminata subrostrata.—*Kunth, Enum.* ii. p. 40 ; *Boeck. in Linnæa*, xxxv. p. 553.

Florida (*h. Calcutta*).

80. C. SURINAMENSIS (*Rottb. Descr. et Ic.* p. 35, t. 6. fig. 5) ; umbella composita aut decomposita, densiuscula ; spicis globosis, multispiculosis ; spiculis 30–40-floris, pallide luteis ; nuce cum $\frac{1}{2}$ parte glumæ æquilonga, oblonga aut anguste ellipsoidea, utrinque subobtusa.—*Kunth, Enum.* ii. p. 43 ; *Boeck. in Linnæa*, xxxv. p. 554.

C. virenti simillima.

Ins. Trinidad (*h. Calcutta*).

Florida (*Chapman, h. Calcutta*).

81. C. CYRTOLEPIS (*Torrey et Hook. in Ann. Lyceum New York*, iii. p. 436) ; umbella decomposita (specie composita) ; umbellularum radiolis pluribus, divaricatis aut deflexis ; spicis 1–4 in capitula ovoidea pyramidatis, pallidis ; nuce cum $\frac{1}{2}$ parte glumæ æquilonga, oblonga, subovoidea apice breviter angustata.—*Boeck. in Linnæa*, xxxv. p. 557.

C. Luzulæ affinis.

Florida : Augusta (*Wray, h. Calcutta* ; *Chapman, h. Calcutta*).

Texas : San Felipe (*Drummond* n. 450, *h. Calcutta*).

82. C. REFLEXUS (*Vahl, Enum.* ii. p. 299) ; umbella composita, contracta aut capitata ; spiculis 14-floris, fusco-sanguineis ; glumis ovatis, in utroque latere remote 1-nervatis ; nuce cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga late ovoidea, utrinque angustata.—*Kunth, Enum.* ii. p. 42 ; *Boeck. in Linnæa*, xxxv. p. 558.

C. hæmatostachys, *Steud. Cyp.* p. 41

Valdivia (*Lechler* n. 283, *h. Calcutta*).

83. C. LUZULÆ (*Rottb. Descr. et Ic.* p. 23, t. 13. fig. 2); umbella composita, specie simplice; spicis in capitula pyramidatis; spiculis lanceolatis, pallidis; nuce cum ⅗ parte glumæ æquilonga, oblonga, utrinque angustata.—*Kunth, Enum.* ii. p. 43; *Boeck. in Linnæa,* xxxv. p. 561.

Brazil: Rio (*Macrae, h. Calcutta*); Prov. Rio Negro, Barra (*Spruce, h. Calcutta*).

Neo-Granada: La Paila (*Holton,* nn. 117, 118, *h. Calcutta*).

84. C. LECHLERI (*Steud. Cyp.* p. 27); robusta; umbella composita aut decomposita, umbellulis primariis condensatis; spiculis ovatis, brunneis.—*Boeck. in Linnæa,* xxxv. p. 563.

Stolones longi, crassi, nigri. Culmus 4–8 dm. longus, basi 15 mm. crassus, nigro-castaneus. Folia plurima, culmum superantia, lata 14 mm., spongiosa transversim septato-punctata. Umbella 8–12 cm. in diam., densa, multispiculosa. Spiculæ longæ 7 mm., latæ 4 mm., circiter 8-floræ. Stamina 3 vel 2.

Valdivia (*Lechler* n. 452, *h. Calcutta*).

Sect. G. *Pseudanosporum.*

Species 1; a Kunth (Enum. ii. p. 40) inter *Luzuloides,* a Boeckeler (Linnæa, xxxv. p. 412) in *Anosporum* collocata; a Bentham (Fl. Austral. vii. p. 264) et Steudel (Cyp. p. 315), *C. alternifolio* &c. affinior habita. (Cf. ff. 7, 8, 9.)

This is a very aberrant species; even assuming, as I have endeavoured to put forward, that the peculiar corkiness of the cells of the nut is merely adaptative, there yet remains much to connect it with *Anosporum,* i. e. to break down *Anosporum* as a genus. On the inner face of the nut (fig. 8) two obscure chinks can be made out which appear analogous with the correspondingly situate deep grooves in the nut of *C. cephalotes,* which Boeckeler interprets as indicating an absorbed perianth. The style is more unlike that of *Anosporum* than of *Cyperus* proper; it is deciduous papillose-floccose nearly to the base, and more like that of some *Fimbristylis* or *Scirpus,* whence R. Brown's excellent specific name. The inflorescence will only do for this part of the genus *Cyperus,* and has doubtless influenced Bentham in his view; but the spikelets themselves, *contrà,* have a hardness reminding much of *C. cephalotes.*

85. C. PLATYSTYLIS (*R. Br.! Prod.* p. 214); robusta; umbella decomposita, densa, spiculis per 3–6 digitatis, pallidis aut aureo-

brunneis; styli papilloso-flocculosi, ramis 3 breviusculis linearibus; nuce sessili, cellulis angulorum suberosis stramineis.—*Kunth, Enum.* ii. p. 111; *Benth.*! *Fl. Austral.* vii. p. 264.

C. pallidus, *Nees*! *in Wight Contrib.* p. 79; *Kunth, Enum.* ii. p. 40.
C. caducus, *Steud. Cyp.* p. 315.
C. fluitans, *Buch.-Ham.*! *MS. in h. Wallich.*
Anosporum pallidum, *Boeck. in Linnæa,* xxxvi. p. 412.
Cyperus, *Wall.*! *List* n. 3337.
Cyperus, *Wall.*! *List* n. 3359, D partim.

Glabra. In lacubus sæpissime natans; radices crasse fibrosæ inter *Pistiam Salviniam* &c. intricatæ, nec repentes nec stoloniferæ. Culmi solitarii, 5–10 dm., sursum triquetri parum scabri. Folia 2–5, cum culmo fere æquilonga, plana, lata 1 cm., in marginibus sursum antice serrato-scabra, manus incautas secantia. Bracteæ 3–6, usque ad 2–5 dm. longæ, divaricatæ, subcorymbosæ nec plane umbellatæ, foliis similes. Umbella 3–25 cm. in diam., 5–1000-spiculosæ; radii aliquando 10–20, usque ad 1 dm. longi, sæpius multo pauciores, minores; ochreæ longæ 1–2 cm., truncatæ, minute bidentatæ; umbellularum partialium bracteæ breves; radioli ultimi undique divaricati; spicæ 1–5-spiculosæ ebracteolatæ. Spiculæ longæ 15 mm., latæ 3 mm., 20–40-floræ, anguste lanceolatæ, compressæ, pallidæ, rubentes aut aureo-castaneæ; rhachilla compressa, fere exalata, quadratim excavata. Glumæ spissæ, imbricatæ, turgidulæ, ovatæ, breviter acutæ, in dorso viridi-3-nerviæ, in lateribus enervosæ. Stamina 3, angulis nucis juxtaposita; filamenta lata, levia, persistentia; antheræ anguste oblongæ, flavæ, a connectivo rubro brevissime excurrente scabro subcristatæ. Stylus nuce multo brevior, deciduus; rami 3, cum stylo æquilongi, e gluma vix exserti. Nux ellipsoidea in rostrum brevissimum angustata, inæqualiter trigona contra rhacheolam adpressa, leviter curvata, in facie interiore concava, in dorso obscurius carinata, fusca margines versus albo-straminea; cellulæ extimæ quadratæ, parvæ, emarcidæ, hyalinæ, persistentes. Cl. Boeckeler transtulit *C. caducum*, Steud., ad *C. Martianum*, Schrader; hic autem in Brasilia, ille in Ind. Or. indigena..

A Bengalia (qua vulgaris) usque ad New South Wales; etiamque in Zeylania. (In Coromandelia verisimiliter rara neque in h. Roxburgh neque in h. Wight vidi.)

Zeylania (*Thwaites, C. P.* n. 3559, *hh. Kew, Mus. Brit., Calcutta*).

Assam (*Simons* nn. 664, 645, *h. Calcutta*; *Masters, h. Calcutta*).

Bengalia: Sahebgunje (*Kurz, h. Calcutta*); Mymensingh, Jumalpore (*Griffith, h. Calcutta*); Bengalia orientalis (*Griffith* nn. 6158, 6158 bis *h. Calcutta*); Chittagong (*J. D. Hooker* n. 139, *hh. Kew, Mus. Brit.*; *C. B. Clarke* n. 19919, *h. Calcutta*).

Burma: Pegu (*Kurz*, nn. 685, 686, 2685, *h. Calcutta*); Mergui (*Griffith, h. Kew* n. 6168).

Penang (*Wallich* n. 3359 D, *h. Calcutta*).

Borneo: Banjermassing (*Motley* n. 995, *h. Kew*).

Australia: Portus Jackson (*R. Brown* n. 5907, *hh. Kew, Mus. Brit.*).

Sect. H. *Haspani.*

Haspani, *Kunth, Enum.* ii. p. 34 (C. pulcherrimo *excl.*); *Boeck. in Linnæa*, xxxv. p. 573 (C. pulcherrimo, albostriato *excl.*).

Rhizoma sæpius perenne. Folia brevia aut longa, angusta, interdum ad vaginas fere reducta. Umbella composita aut decomposita, spicis ultimis digitatis paucispiculosis. Spiculæ multifloræ, compressæ; rhachilla obscurius alata. Glumæ spissæ, in speciebus typicis minute mucronatæ, in cæteris obtusæ. Stamina 3–1; antheræ sæpius cristatæ, crista modo elongata, modo fere suppressa, albide glochidiato-spinulosa, raro omnino nulla. Nux parva, in speciebus typicis minuta.

The next Section (Diffusi) differ by their wider leaves and bracts and larger nut. I think therefore *C. albostriatus* ought certainly to be placed among the Elegantes, though the amount of real difference between the two sections is small. As to *C. pulcherrimus* it seems (with *C. silletensis*) to me to stand very naturally next *C. difformis* and *C. fuscus*; indeed I find *C. pulcherrimus, C. silletensis*, and *C. difformis* are much confounded in herbaria. As to *C. vaginatus*, seeing that it can stand in the Haspani without introducing an exception to their character, it makes one section less to arrange it here.

86. C. Haspan (*Linn. Sp. Pl.* p. 66, partim, *nec Linn. h. propr.*); matura viridis pallida aut atrosanguinea nec flavida; radice perenni, repente; foliis brevibus, longis aut nullis; involucri foliis sæpius 2 brevibus, interdum longis; spiculis parvis, lineari-oblongis; staminibus 3–2; nuce parva, obovoidea obtusiuscula, acute trigona, pallida aut brunnescente, scabrida vel fere levi.—*Roxb. Fl. Ind.* i. p. 210; *Nees in Wight Contrib.* p. 80;

Kunth, Enum. ii. p. 34; *Dalz. and Gibs. Bomb. Fl.* p. 282; *Nees in Mart. Brasil., Cyp.* p. 25; *Boeck. in Linnæa,* xxxv. p. 574, var. *a* excl.; *Benth. Fl. Austral.* vii. p. 270.

C. umbellatus, *Burm. Fl. Ind.* p. 21, t. 9. fig. 1; *Vahl, Enum.* ii. p. 362, *nec Roxb., nec Benth.*
C. autumnalis, *Vahl, Enum.* ii. p. 318 (*syn. Rottb. excl.*).
C. platyculmis, *R. Br. Prod.* p. 214.
C. laticulmis, *Spreng. Syst.* i. p. 228.
C. juncoides, *Lam. Ill.* i. p. 147, *fide Vahl.*
C. complanatus, *Willd. Sp. Pl.* i. p. 270.
C. leptos, *Roem. et Sch. Syst. Mant.* ii. p. 105; *Torrey in Ann. Lyceum New York,* iii. p. 273.
C. gracilis, *Muehl. Gram.* p. 18.
C. tunicatus, *Roem. et Sch. Syst. Mant.* ii. p. 115.
C. stellatus et C. cayennensis, *Willd.*; *Link, Jahrb.* iii. p. 84.
C. junceus, *Willd.*; *Link, Jahrb.* iii. p. 85.
C. vaginatus, *Willd.*; *Link, Jahrb.* iii. p. 85, *non R. Br.*
C. aphyllus, *Rich. in Vahl, Eclog.* ii. p. 6.
C. nudus, *H. B. K. Nov. Gen. et Sp.* i. p. 203; *Presl, Rel. Haenk.* p. 166.
C. riparius, *Schrad.*; *Nees in Mart. Brasil., Cyp.* p. 28.
C. hyemalis, *Pursh MS. in h. propr.*
Cyperus, *Linn. Fl. Zeyl.* p. 15, n. 37.
Cyperus, *Wall.*! *List* n. 3368.
Cyperus, *Wall.*! *List* n. 3372.
Cyperus, *Wall.*! *List* n. 3369, litt. D, E, F, G n. 1.
Cyperus, *Wight* n. 1822, b.
Cyperacea, *Griff. Itin. Notes,* p. 33, n. 520.
Cyperacea Indeterm., *Wall. h. propr.* n. 4.

Rhizoma perenne, repens, culmis solitariis, distantibus (forma typica fig. 23) aut cæspitosis (fig. 24); aut in primo anno sæpe florigerum, radicibus fibrosis. Culmi 1–5 dm., apice triquetri, inferne sæpe inæqualiter triquetri aut fere ancipites. Folia plura, in forma typica culmo multum breviora, aut sæpe subnulla, vaginis inflatis, apice lanceolatis, acutis. Involucri bracteæ 2, raro 3, suberectæ anguste xiphoideæ, in forma typica breves, umbellam raro superantes. Umbellæ radii 4–12, usque ad 4–12 cm. longi, interdum plane corymbosi; vaginæ longæ 5–10 mm., apice lanceolatæ; umbellulæ 3–8-radiatæ, interdum iterum divisæ. Spiculæ 3–10, subdigitatæ, ebracteatæ, longæ 10–15 mm., latæ 1–2 mm., multum compressæ, 10–40-floræ; rhachilla subexalata. Glumæ spissæ, fusco-virides, pallidæ aut atrosanguineæ, ovatæ, obtusæ, obscure mucronatæ, compressæ, in dorso 3–1-nerviæ.

Stamina 3 aut 2; filamenta persistentia, granulosa aut subscabrida; antheræ lineari-oblongæ, flavidæ, apice albide setosæ, (rarius leves), crista obsoleta. Stylus brevis, nuce vix longior; rami 3, e gluma vix exserti. Nux cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, non (aut sat obscure) compressa, basi umbonato-dilatata, in forma indica pallide brunnea aut flava, cellulæ extimæ quadratæ, neque incrassatæ neque opacæ.—Rottb. Ic. t. 6, fig. 2, ex exemplo Africano depicta, est *C. flavidus*, var. *africana*.—Rottb. Ic. t. 17. fig. 3, involucro bracteis pluribus setaceis additis, est fortasse revera *Scirpus*, ut a Rottboellio nominatus.—Species parum variabilis; exempla juniora, in primo anno florentia, a *C. flavido* ope coloris viridis, nucis trigonæ, spicularum majorum distinguenda sunt. Formæ sequentes pro varietatibus vix habendæ:—forma *malasica*; foliis laxe herbaceis quam culmi multo longioribus, bracteis elongatis (in Wall. List n. 3369 usque 3 dm. longis): forma in Malaya, China præcipue obvia. Forma *americana*; rhizomate brevi; spiculis haud raro subcastaneis; nuce sæpe scabrida: in America et in Africa tropicali frequens.

Asia australi-orientalis; Australia; America calidior; Africa occidentalis tropica.

India orientalis, ubique vulgaris: Sikkim, alt. 600 metr. (*G. King* n. 4812, *h. Calcutta*); India centralis (*G. King, h. Calcutta*); Assam (*Jenkins* n. 740, *h. Calcutta*); Khasia (*Oldham, h. Calcutta*; *Griffith* n. 520, *h. Kew*); Sylhet (*Wallich* nn. 3368, 3372, *h. Calcutta*); Bengal (*Griffith* n. 6216, *hh. Kew, Calcutta*); Madras Peninsula (*Hohenacker* n. 691, *hh. Kew, Mus. Brit.*).

Zeylania (*Thwaites* n. 794, *h. Kew*, n. 799 *h. Mus. Brit.*, n. 805 partim *h. Calcutta*).

Burma et Malaya, communis: Pegu (*Kurz*, nn. 677, 679, 681, *h. Calcutta*); Tavoy (*Wallich* n. 3369 H, *h. Calcutta*); Tenasserim (*Helfer, h. Kew*, n. 6216); Ins. Bangka (*Amand, h. Kew*); Java (*Zollinger* n. 269, *hh. Kew, Mus. Brit.*); Cochinchina (*Lebœuf, h. Kew*).

[Forma *malasica*: Java (*Horsfield, h. Mus. Brit.*); Ins. Nicobar (*Kurz* n. 25979, *h. Kew*); Borneo (*Motley* n. 98, *h. Kew*; *Barber* n. 194, *h. Kew*); Hongkong (*C. Wright* n. 557, *h. Kew*; *Wilford* n. 48, *h. Kew*); Canton (*Sampson* n. 260, *h. Kew*).

Australia (*Cunningham* n. 331, *h. Mus. Brit.*); sinus Carpentaria (*R. Brown* n. 5911, *hh. Kew, Mus. Brit.*); Sinus Moreton (*Macgillivray, h. Kew*); Portus Darwin (*F. Schultz* n. 310, *h. Kew*).

America australis, vulgaris: Paraguay (*Balansa* nn. 406, 409, *h. Kew*); Brasil (*Glaziou* nn. 5449, 6768, *h. Kew*; *Burchell* nn. 1169, 1663, 2640, 2754, 3451, 4192, 4464, 4481–2, 5819, 9907, *h. Kew*); Organ montes (*Gardner* n. 713, *hh. Kew, Mus. Brit.*); Surinam (*Hostmann* n. 711, *h. Kew*); Guiana Francorum (*Sagot* nn. 645, 1178, *hh. Kew, Mus. Brit.*); Venezuela (*Funcke* n. 230, *h. Kew*; *Moritz* n. 766, *h. Mus. Brit.*; *Funcke* n. 705, *h. Mus. Brit.*).

India occidentalis, cum terris adjacentibus: Panama (*Hayes* n. 316, *h. Kew*); Mexico (*Liebmann, h. Kew*); Cuba (*C. Wright* n. 3359, *hh. Kew, Mus. Brit.*; *C. Wright* n. 3358, *h. Mus. Brit.*); New Orleans (*Drummond, h. Calcutta*); Florida (*Curtiss* n. 3041, *h. Kew*; *Chapman, h. Calcutta*); Alabama (*Gates, h. Calcutta*); Georgia (*Beyrich* n. 535, *h. Mus. Brit.*).

Africa occidentalis tropica; Niger flumen (*Barter* n. 1572, *h. Kew*); Nun flumen (*Vogel* n. 13, *h. Kew*); Congo flumen (*Christian Smith* nn. 19, 47, *h. Mus. Brit.*).

Africa orientalis tropica: Mombassa (*Hildebrandt* n. 2045, *h. Kew*).

Madagascar (*Hilsenberg et Bojer, h. Mus. Brit.*)].

87. C. FLAVIDUS (*Retz. Obs.* v. p. 13); matura flavida aut nigrescens; radice fibrosa; foliis cum culmo sæpe æquilongis; involucri bracteis 2–3, sæpe elongatis; umbella composita aut decomposita; spiculis minimis, lineari-oblongis; stamine 1, raro 2; nuce minima, obtuse obovoidea, contra rhachillam compressa, in dorso convexa aut vix carinata, albida marmorata, scabra vel punctata.—*Roxb. Fl. Ind.* i. p. 200; *Dalz. and Gibs. Bomb. Fl.* p. 284; *Nees in Wight Contrib.* p. 80 in nota; *Hassk. Pl. Jav. Rar.* p. 71 in nota.

C. tenuispicus, *Steud.*! *Cyp.* p. 11, *in Pl. Hohen.* n. 1670.

C. Fieldingii, *Steud. Cyp.* p. 11, *fide Wallich n. cit. et descr.*

C. leptostachyus, *Nees*; *Steud. Cyp.* p. 33.

C. Haspan, *Rottb. Descr. et Ic.* p. 36, t. 6. fig. 2; *Thwaites*! *Enum. Pl. Zeyl.* p. 343 partim; *Boeck. in Linnæa*, xxxv. p. 574, var. *a*; *Oliver*! *in Trans. Linn. Soc.* xxix. p. 165; *Rottler, MS. in h. propr.*; *Wight*! n. 1822 *a h. propr.*; *non Linn.*

C. microcarpus, *Boeck. in Rel. Rutenb.* i. p. 37.

Cyperus, *Wall. List* n. 3365.
Cyperus, *Wall. List* n. 3369, A, B, C, G n. 2.
Cyperus, *Wall. List* n. 3313, plagula tertia.
Cyperus, *Wight* n. 2874, *h. propr.*
Cyperus, *Griff. Itin. Notes*, p. 14, n. 199.
— *Pluk. Alm.* t. 192. fig. 2.

Annua. Culmi cæspitosi, a 2 cm. usque ad 3 dm. longi, trigoni. Folia graminea, sæpius elongata, rarius brevia interdum in vaginas reducta. Umbella multiradiata, 5–20 cm. in diam. Spiculæ longæ 5–12 mm., latæ 1 mm., compressæ, 8–30-floræ. Glumæ quam *C. Haspani* minores, magis truncatæ, proventu laxe (vel vix) imbricatæ. Antheræ quam *C. Haspani* breviores, apice non setosæ. Nux obtusissima; cellulæ extimæ magnæ, quadratæ.

India orientalis, alt. 0–1200 metr., ab Himalaya usque ad Zeylaniam vulgaris, in oryzetis pestis: Kashmir (*Jacquemont* n. 1140, *h. Kew*); Nepaul (*Wallich* n. 3365 B, *h. Calcutta*); Assam (*Jenkins, Simons, h. Calcutta*); Khasia colles (*Griffith* n. 199, *h. Kew* n. 6209/5); Sylhet (*Wallich* n. 3365 C, *h. Calcutta*); Bengal, Burisal (*C. B. Clarke* n. 16947, *h. Calcutta*); Chota Nagpore, alt. 600 metr. (*C. B. Clarke* nn. 20845, 25192, *h. Calcutta*); Canara (*Hohenacker* n. 1670, *h. Kew*); Madras Peninsula (*Wight* n. 2874, *h. Calcutta*); Arracan (*Kurz* n. 677, *h. Calcutta*).

Zeylania (*Thwaites, C. P.* n. 805, *hh. Kew, Mus. Brit.*).

Australia, Victoria flumen (*F. Mueller, h. Kew*).

Ins. Seychelles (*Horne* n. 634, *h. Kew*).

Africa: Zanzibar (*Kirk, h. Kew*; *Blackburn, h. Kew*); Nilus flumen superior (*Grant, h. Kew*); Djur (*Schweinfurth* nn. 194, 2054, *h. Kew*); Niger flumen (*Barter* n. 1566, *h. Kew*); Senegal (*Roger* n. 38, *h. Kew*; *Heudelot* n. 325, *h. Mus. Brit.*; *Adanson* n. 164, *h. Mus. Brit.*).

88. C. ÆQUALIS (*Vahl, Enum.* ii. p. 320); subaphyllus; radiis umbellæ primariis, innumerosis, æqualibus, tenuibus.—*Kunth, Enum.* ii. p. 37; *Boeck. in Linnæa*, xxxv. p. 577.

Umbellæ radii primarii usque ad 100, longi 1 dm. Antheræ flavidæ a crista minuta rubra albide setose coronatæ. Nux minutissima, cum $\frac{1}{4}$ parte glumæ vix æquilonga, trigona, pallida.—Species primo adspectu, causa inflorescentiæ, *Cyperum Papyrus* referens.

Ins. Mauritius (*Bojer, h. Calcutta*).

Portus Natal (*Sutherland, h. Calcutta*).

89. C. DENUDATUS (*Vahl, Enum.* ii. p. 324); rhizomate repente; foliis cum $\frac{2}{3}$ parte culmi subæquilongis; umbella composita; spiculis 3–6nis digitatis, lanceolatis, 8–10-floris, brunneis.—*Kunth, Enum.* ii. p. 36; *Boeck. in Linnæa,* xxxv. p. 576.

C. sphærospermus, *Schrad. Anal. Fl. Cap., Cyp.* p. 8.

Antheræ lineari-oblongæ, rubescentes; crista minima, quadrata, albida, non setosa.

Caput Bonæ Spei: Uitenhage (n. 175, *h. Calcutta*).

90. C. DENTATUS (*Torrey, Fl. United States,* i. p. 61); foliis cum culmo subæquilongis; umbella composita aut decomposita; spiculis 3–6nis digitatis, 8–16-floris, lucide brunneo-viridibus.—*Kunth, Enum.* ii. p. 34; *Boeck. in Linnæa,* xxxv. p. 578.

Stolones longi. Antheræ lineari-oblongæ, rubræ, apice a crista hyalina oblonga serrato-scabra terminatæ. Nux cum $\frac{1}{2}$ parte glumæ æquilonga, late ellipsoidea, trigona.

Massachusetts (*Jesup, h. Calcutta*).

91. C. LEPIDUS (*F. Muell. MS., nec Hochst., nec Nees*); foliis bracteisque longis, duris; umbella composita, radiis radiolisque divaricatis; spiculis 2–4nis digitatis, ellipsoideis, admodum compressis, castaneo-brunneis; glumis spissis, obtusis.

Culmi 15 cm.; basi incrassati, a vaginis corneis striatis brunneis intecti. Spiculæ longæ 5 mm., latæ 2 mm., 10–14-floræ (spiculas *Brizæ* quodammodo referentes). Stamina 2 (vel 3); antheræ lineari-oblongæ, rubræ, muticæ. Nux nimis juvenis.

Australia: Snowy flumen (*F. Mueller, h. Calcutta*).

92. C. VAGINATUS (*R. Br. Prod.* p. 69, *non Willd.*); subaphylla; culmis rigidis, teretibus; involucri bracteis pluribus, 1–3 cm. longis; umbella capitata.—*Boeck. in Linnæa,* xxxv. p. 472.

Rhizoma lignescens, horizontale. Culmi approximati, 5 dm. longi, usque ad 1 dm. a vaginis intecti; vaginorum pars libera rigida, lanceolata, striata, non foliiformis. Involucri bracteæ xiphoideæ, rigidæ, scabræ. Antherarum cristæ cum $\frac{1}{3}$–$\frac{1}{2}$ parte loculorum æquilongæ, lineari-lanceolatæ, rubræ, scabridæ.

Australia: Government flumen (*Drummond. h. Calcutta*).

Sect. I. *Diffusi.*

Diffusi, *Kunth, Enum.* ii. p. 25, partim; *Boeck. in Linnæa,* xxxv. p. 531.

Radix perennis, valide fibrosa, sæpe nigra, interdum repens.

Folia plura, longa et lata, plana, viridia, conspicue striata; involucri bracteæ foliis similes. Umbella composita aut decomposita, non congesta, spicis ultimis digitatis, paucispiculosis. Spiculæ multifloræ, compressæ, virides pallidæ aut fuscæ; rhachilla anguste alata. Glumæ breviter mucronatæ aut acutæ. Stamina sæpissime 3; antheræ lineari-oblongæ, apice sæpe cristatæ aut setosæ. Nux robusta, ellipsoidea aut obovoidea, acute trigona.

This is a small group of very closely allied species, easily recognized by the numerous broad leaves and bracts. It is a striking proof how little real difference in structure there is between the whole of *Eucyperus*, that Bentham thinks *C. multispicatus*, from its small nut, should, perhaps, rather be placed among the Haspani; while, on the other hand, *C. macer*, nov. sp., below among the Corymbosi, seems to me to belong really to the Diffusi, but has such short and narrow leaves and bracts that it could only be placed here as a sp. anomala.

93. C. ELEGANS (*Linn. Sp. Pl.* p. 68); culmo solitario; involucri bracteis pluribus, longis, latis, viridibus, in margine scabris; umbella composita aut decomposita; glumis late ovatis, subito acutato-mucronatis, multinerviis, subdistantibus, fructigeris laxe imbricatis; nuce cum $\frac{2}{3}$ parte glumæ æquilonga, late ellipsoidea, utrinque angustata.—*Vahl, Eclog.* ii. p. 7, *Enum.* ii. p. 323; *Meyer, Fl. Esseq.* p. 28; *Kunth, Enum.* ii. p. 28; *Nees in Mart. Brasil., Cyp.* p. 33; *Boeck. in Linnæa*, xxxv. p. 532.

C. laxus, *Lam. Ill.* i. p. 146; *Griseb. Fl. Brit. West Ind.* p. 563.
C. parciflorus, *Willd.*; *Link, Jahrb.* iii. p. 85.
C. toluccensis, *H. B. K. Nov. Gen. et Sp.* i. p. 206; *Kunth. Enum.* ii. p. 28.
C. umbrosus, *Lindl. et Nees in Mart. Brasil., Cyp.* p. 31.
C. mœstus, *Kunth, Enum.* ii. p. 31.
C. racemosus, *Steud.! Cyp.* p. 52, *non Retz.*
C. nigroviridis, *Thwaites, Enum. Pl. Zeyl.* p. 344.
C. digitatus, *Wall. MS. in h. propr., non Roxb.*
C. microstachyos, *Rottler in h. propr., non Vahl.*
Cyperus, *Wall.! List* n. 3358.
Cyperus, *Wall.! List* n. 3362.
Cyperus, *Wall.! List* n. 3370, A.
Cyperacea indeterm., *h. Wallich* n. 5.
Hypelytrum, *Griff. Itin. Notes*, p. 17, n. 243.
— *Sloane, Jamaica*, i. p. 117, t. 75. fig. 1.

Radix perennis, lignescens, a fibris nigris validis defixa. Culmus 4–10 dm., trigonus, in americanis interdum gracilis, in gerontogeis sæpius robustus, triqueter. Folia basin versus culmi plura, cum culmo æquilonga, viridia, lata (in gerontogeis sæpe 10–15 mm. lata), in marginibus scabra, in gerontogeis sæpe serrulata. Involucri bracteæ 4–10, cum foliis consimiles, longæ 3–6 dm., latæ 5–12 mm. Umbellæ radii 3–10, in americanis sæpe 1–2 dm. longi, in gerontogeis multo breviores; umbellulæ in americanis pluriradiolatæ, sæpe bracteolatæ, radiolis 2–5 cm. longis, in gerontogeis breviuscule divaricatim radiatæ; umbella in americanis sæpius composita aut decomposita, in gerontogeis sæpe decomposita aut supradecomposita, fasciculis numerosis densa. Spiculæ 3–9næ, digitatæ, in americanis usque ad 12–20 mm. longæ, 3–4 mm. latæ, 10–24-floræ, in gerontogeis sæpius minores angustiores, interdum 4–6-floræ. Glumæ laxius (fructigeræ vix) imbricatæ, naviculares, in dorso late virides 5-nerviæ, in lateribus latiusculis scariosæ, pluristriatæ, maturæ glauco-virides aut sæpius in americanis pallide scariosæ, in gerontogeis luteæ aut fere castaneæ; rhachillæ alæ angustæ aut latiores non solubiles. Stamina 3–2; antheræ subinclusæ, lineari-oblongæ, flavidæ, a crista parva lineari-lanceolata scabra alba sæpe coronatæ. Stylus vix ullus; rami 3, e gluma breviter exserti. Nux triquetra, apice obtuse conica, aut (in gerontogeis) magis acutata; matura nigro-fusca, immatura specie granulosa; cellulæ extimæ quadratæ, persistentes, hyalinæ, nec porosæ nec reticulatæ.—Exempla raro prolifera.—Species difficillima: exempla americana formam unicam constituunt; exempla gerontogea polymorpha sunt, neque a *C. diffuso* bene digerere potui.

America calidior; India orientalis, China, Malaya; præsertim in sylvis udis inter saxa radicans, neque in oryzetis.

America, sat communis: Paraguay (*Balansa* n. 412, *h. Kew*); Brasilia (*Burchell* nn. 1044, 1218, 1461, 1496, 1627, 6459, 8438, 8474, 9808, *h. Kew*; *Martius* n. 545, *hh. Kew, Mus. Brit.*; *Gardner* n. 2838, *h. Kew*); Bahia (*Saltzmann*, C. umbrosus, *h. Calcutta*); Para, Santarem (*Spruce*, *h. Calcutta*); Amazon flumen (*Traill* n. 1167, *h. Kew*).

Venezuela (*Funcke* n. 711, *h. Mus. Brit.*).

Guiana (*Schomburgk* n. 461, *hh. Kew, Mus. Brit.*).

Surinam (*Berthoud-Coulon* nn. 54, 56, *h. Mus. Brit.*).

Ins. Trinitas (*Sieber* n. 9, *h. Kew*; *Fendler* n. 893, *h. Mus. Brit.*).

Jamaica (*Swartz*, *h. Mus. Brit.*).

India orientalis, alt. 0–1500 metr., in Bengal et peninsula Malayana: Sikkim, alt. 1500 metr. (*C. B. Clarke* n. 9836, *h. Kew*); Sikkim Terai (*Gamble, T. Anderson, Kurz, h. Calcutta*); Assam (*Griffith* n. 6162, *hh. Kew, Calcutta,* n. 1605, *h. Mus. Brit.*; *Jenkins* n. 574, *h. Kew*; *Simons, Masters, h. Calcutta*); Khasia colles (*J. D. Hooker* n. 1902, *h. Kew*; *Oldham* n. 8, *h. Calcutta*), alt. 1200 metr. (*J. D. Hooker et T. Thomson, h. Calcutta*); Sylhet (*Griffith, h. Kew* n. 6218); Yunan (*J. Anderson, h. Calcutta*); Chittagong (*J. D. Hooker* n. 386, *h. Kew*); Mergui (*Griffith, h. Kew* n. 6354); Rangoon (*Wallich* n. 3362 A, *h. Calcutta*); Tenasserim (*Helfer, h. Kew* n. 6161); Ins. Andaman (*Kurz, h. Kew*).

Madras Peninsula, montes Anamallay (*Beddome, h. propr.*).

Zeylania (*Thwaites, C. P.* n. 2879, *hh. Kew, Mus. Brit., Calcutta*).

Java (*Zollinger* n. 720, *h. Mus. Brit.*); Buitenzorg (*Kurz* n. 1847, *h. Calcutta*).

Borneo (*Motley* n. 65, *h. Kew*; *Barber* n. 327, *h. Kew*).

Whampoa et Canton (*Hance* n. 2149, *h. Kew*).

94. C. DIFFUSUS (*Vahl, Enum.* ii. p. 321); culmo solitario; involucri bracteis pluribus, longis, latis, viridibus; umbella composita aut supradecomposita; glumis spissis, ovatis, subito acutato-mucronatis, multinerviis; nuce cum $\frac{2}{3}$–$\frac{3}{4}$ parte glumæ æquilonga, late ellipsoidea, acute trigona.—*Kunth, Enum.* ii. p. 30; *Boeck. in Linnæa,* xxxv. p. 534, *non Roxb.*

C. iridifolius, *Dietr. Sp. Pl.* ii. p. 315.
C. scirpoides, *Presl, Rel. Haenk.* i. p. 178.
C. pubisquama, *Steud. Cyp.* p. 20.
C. lagorensis, *Steud. Cyp.* p. 36.
Cyperus, *Wall.*! *List* n. 3370, B.

Differt a *C. elegante* glumis arctius imbricatis; an satis? Folia (ut bracteæ) quam in *C. elegante* minus scabra, vix serrulata. Spiculæ haud raro in radiolis 5–10 mm. longis pedicellatæ, solitariæ, i. e. umbellulæ ultimæ 1–2-spiculosæ. Glumæ in forma typica luzonensi vix quam in *C. elegante* densius stipatæ; in forma indica spiculæ majores, teretes, densifloræ, in unica umbella usque ad 800. Glumæ in margine sæpe sublaceræ (nec pubescentes), superiores interdum in folia mutatæ, i. e. spiculæ proliferæ. In forma indica, stylus subnullus, rami autem longiusculi, spiculæque fere comosæ evadunt. Nux omnino ut *C.*

elegantis; cellulæ extimæ interdum albescentes, opacæ, i. e. nux granulata videtur.

India orientalis, Zeylania, Malaya, ins. Philippine.

Sikkim (*Kurz*, *T. Anderson*, *h. Calcutta*).

Assam (*Jenkins*, *Masters*, *h. Calcutta*).

Khasia colles (*Hooker f. et T. Thomson*, *h. Kew*); alt. 300 metr. (*C. B. Clarke* n. 5468, *h. Kew*).

Cachar (*Keenan*, *h. Kew*).

Chittagong (*C. B. Clarke*, n. 19689 *h. Kew*, n. 8292 *h. Calcutta*).

Pegu (*Kurz* nn. 665, 666, *h. Calcutta*).

Moulmein (*Griffith* nn. 320, 324, *h. Kew* n. 6162).

Tenasserim (*Helfer*, *h. Kew* n. 6164/1).

Bhamo (*J. Anderson*, *h. Calcutta*).

Rangoon (*Wallich* n. 3474, *h. Calcutta*).

Ins. Penang et Amherst (*Wallich* n. 3370, *h. Calcutta*).

Ins. Andaman et Nicobar (*Kurz*, *h. Calcutta*).

Zeylania (*Thwaites*, *C. P.* n. 3931, *hh. Kew*, *Mus. Brit.*, *Calcutta*).

Borneo (*Barber* n. 327, *h. Kew*).

Timor (*Kunstler* n. 331, *h. Calcutta*).

Ins. Philippine (*Cuming* nn. 445, 533, 534, *hh. Kew*, *Mus. Brit.*).

Forma *pedicellata*; spiculis fere omnibus pedicellatis, solitariis.

Arracan (*Kurz*, *h. Calcutta*).

Tenasserim v. Andamans (*Helfer* n. 6161, *h. Calcutta*).

95. C. HELFERI (*Boeck. in Linnæa*, xxxviii. p. 360); culmis cæspitosis; involucri bracteis 3–6, longis; umbella composita, laxiuscula; glumis ovato-lanceolatis, submucronatis; nuce cum ½ parte glumæ æquilonga, obovoidea, triquetra.

Fimbristylis, *Wall.*! *List* n. 3528.

Radix fibrosa, valida, nigra. Culmi 3–5 dm. longi, trigoni, graciliores. Folia plura, cum ⅔ parte culmi æquilonga, graminea, lata 5 mm. Involucri bracteæ usque ad 1–2 dm. longæ. Umbellæ radii erecto-patuli, inæquales, longi 3–12 cm.; umbellularum radioli pauci. Spiculæ 3–7næ fasciculatæ, longæ 1–2 cm., latæ 3 mm., glauco-virides, compressæ, 10–30-floræ; rhachilla subexalata. Glumæ distantes, naviculares, in dorso virides nervis obsoletis scil. coalitis, in lateribus scariosæ subenerviæ. Stylus brevissimus; rami 3, e gluma breviter exserti. Nux obtusa, pallide brunnea; cellulæ extimæ quadratæ, hyalinæ, ideoque nux quasi reticulata.

Peninsula Malayana: Burma (*Griffith, h. Kew*); Pegu (*Kurz* nn. 670, 2680, *h. Calcutta*); Chappedong (*Wallich* n. 3528, *hh. Linn. Soc., Kew, Calcutta*); Tenasserim (*Helfer* n. 6140, *hh. Kew, Calcutta*); Mergui (*Griffith* n. 321, *h. Kew* n. 6140).

96. C. MULTISPICATUS (*Boeck. in Linnæa*, xxxviii. p. 362); involucri bracteis 5–6 longis, viridibus; umbella decomposita aut supra decomposita, magna, laxa; spiculis pro majore parte solitariis, multifloris, admodum compressis; nuce cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, obovoidea, obtusa, trigona.

Radix valide fibrosa. Culmus 3–8 dm. longus, robustior, apice triqueter, deorsum subcompressus. Folia 2–3, cum $\frac{2}{3}$ parte culmi æquilonga, in margine scabra vix serrulata. Involucri bracteæ usque ad 3–5 dm. longæ, sæpe 1 cm. latæ. Umbella 3 dm. in diam.; radii 8, usque ad 12 cm. longi; umbellulæ bracteatæ, radioli 3–12, suberecti, sæpe 3–6 cm. longi. Spiculæ numerosæ, in exemplo typico fere omnes solitariæ, longæ 1 cm., latæ vix 2 mm., 24-floræ, pallide brunneæ; rhachilla subexalata. Glumæ subdistantes, leviter imbricatæ, naviculares, ovatæ, obtusæ, minute vel obscure mucronatæ, in dorso sub-3-nerviæ, in lateribus ferrugineo-maculatæ. Stamina 2; antheræ vix exsertæ, lineari-oblongæ, rubræ, fere muticæ. Stylus nuce vix longior; rami 3, e gluma breviter exserti. Nux luteo-brunnea, quasi-puncticulata. —Species a Bentham (causa nucis parvæ) inter Haspanos ordinata.

Tenasserim vel Andamans (*Helfer* n. 6163, ***hh. Kew, Calcutta***). Cachar (*Keenan*, ***h. Kew***).

97. C. KURZII; foliosa; umbella decomposita, radiolis divaricatis; spiculis 1–4nis digitatis, stramineo-brunneis; glumis spissis arctissime stipatis, ovatis mucronatis, basi late breviter decurrentibus; staminibus 2.

C. multispicatus, ***Kurz MS.***

C. multispicatus, ***Boeck.*; var. Kurzii,** ***C. B. Clarke, MS. in h. Kew.***

Rhizoma validum, breve, lignosum. Culmi longi 6 dm., apice triquetri. Folia 5–8, cum culmo æquilonga, lata 7 mm., sub-3-nervia. Involucri bracteæ 5–6, foliis consimiles, usque ad 2–4 dm. longæ. Umbella 1–2 dm. in diam., densiuscula; radii 8–16; radioli tenues, divaricati; umbellularum bracteolæ minutæ. Spiculæ (sæpe pedicellatæ solitariæ) longæ 12 mm., latæ 1–2 mm., usque ad 40-floræ, multum compressæ; rhachillæ alæ latæ, breves, persistentes. Glumæ carinatæ, in dorso 3–5-nerviæ, in lateribus subenerviæ, maculatæ. Antheræ juniores lineari-lanceolatæ cum $\frac{2}{3}$–$\frac{3}{4}$ parte glumæ æquilongæ, rubræ; in plurimis spiculis monstrosæ in phyllodia imperfecte transmutatæ.

Ins. Andaman, Phæacia (*Kurz in hh. Kew, Calcutta*).

98. C. TURGIDULUS; culmo subtrialato; involucri bracteis pluribus, longis, latis, viridibus; umbella composita aut decomposita, densa, radiolis divaricatis; spiculis ovoideis, teretibus, paucifloris, in capitula parva subglobosa fasciculatis; glumis nucibusque ut *C. elegantis.*

Scirpus trialatus, *Boeck. in Linnæa*, xxxvi. p. 721.

Species *C. eleganti* admodum affinis, cum hac (nisi quoad notas supra datas) arcte congruens. Spiculæ c. 6-floræ, longæ 4 mm., latæ 3 mm., inflatæ, fere teretes. Glumæ latiores quam longæ.

Peninsula Malayana, a Burma usque ad Malacca et Cambodia.

Pegu (*Kurz* n. 655, *h. Calcutta*).
Moulmein (*R. Scott, h. Calcutta*).
Tavoy (*Wallich, h. Kew*).
Martaban (*Kurz, h. Calcutta*).
Amherst (*Wallich, h. Kew*).
Mergui (*Griffith* nn. 88, 98, *h. Kew*).
Tenasserim (*Helfer* n. 6164, *hh. Kew, Calcutta*).
Malacca (*Griffith* n. 6164, *h. Kew*).
Siam (*Lebœuf* n. 457, *h. Kew*).
Cochinchina (*Lebœuf* n. 827, *h. Kew*).

99. C. LONGIFOLIUS (*Poir. Encyc.* vii. p. 270); foliis longissimis, latis; umbella decomposita; spiculis 1–5nis digitatis, 4–8-floris; glumis ovatis, mucronatis, per totam fere latitudinem 9–13-nerviis; nuce cum $\frac{2}{3}$ parte glumæ æquilonga, ellipsoidea, trigona, nigra.—*Kunth, Enum.* ii. p. 30, syn. Decaisne excl.; *Boeck. in Linnæa*, xxxv. p. 535.

Mauritius (*Bojer, h. Calcutta*).

100. C. ALTERNIFOLIUS (*Linn. Mant.* p. 28); bracteis plurimis, latis; umbella imperfecta, plane subcorymbosa, composita aut decomposita, radiis radiolisque numerosis, tenuibus; spiculis 2–5nis digitatis, brunneis, 14-floris; glumis ellipticis, elongatis, muticis, tenuiter nervosis; nuce cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, anguste ellipsoidea, utrinque angustata.—*Kunth, Enum.* ii. p. 33; *Boeck. in Linnæa*, xxxv. p. 568.

Madagascar.—(Exempla culta plurima visa.)

101. C. ALBOSTRIATUS (*Schrad. Anal. Fl. Cap. Cyp.* p. 7); bracteis 6–10, longis 1 dm., lineari-lanceolatis, 3-nerviis; umbella laxa, 2 dm. in diam., radiis filiformibus, umbellulis depauperatis; spiculis pro magna parte solitariis.—*Kunth, Enum.* ii. p. 34; *Boeck. in Linnæa*, XXXV. p. 581.

Rhizoma repens, a squamis lanceolatis, nigro-brunneis intectum. Culmi solitarii, 3 dm. longi. Spiculæ longæ 8 mm., latæ vix 2 mm., 8–16-floræ, pallide virides; rhachillæ alæ conspicuæ, hyalinæ, sanguineo-maculatæ. Nux gluma parum brevior, ellipsoidea, utrinque acutata, acute trigona.

Natal (*Dr. Sutherland, h. Calcutta*).

102. C. PEDUNCULOSUS (*F. Mueller, MS. in h. Calcutta*); foliis bracteisque latis; umbella simplice, radiis longissimis; spiculis 4–7nis, digitatis, 40-floris.

Culmi 3 dm. Folia cum culmo fere æquilonga, lata 12 mm., 1-nervia, multistriata. Bracteæ 8 usque ad 15 cm. longæ, 10 mm. latæ. Umbellæ radii 7–12, usque ad 2 dm. longi. Spiculæ 2–3 cm. longæ, compressæ; rhachillæ alæ hyalinæ, angustæ. Glumæ laxe imbricatæ, ellipticæ, muticæ, in dorso virides, in lateribus pallide brunneæ.—*C. albostriato* similis, sed major.

Australia, sinus Rockingham (*Dallachy, h. F. Mueller*).

Sect. K. *Fusci.*

Fusci, *Kunth, Enum.* ii. p. 37; *Boeck. in Linnæa*, XXXV. p. 585 (*C. Iria* adjecto).

Annuæ, foliatæ. Umbella simplex, composita aut decomposita, spicis ultimis sæpius densis, multispiculosis, in *C. Iria* laxe spicatis. Spiculæ multifloræ, compressæ; rhachilla anguste alata. Glumæ parvæ, laxe imbricatæ, late ovatæ, obtusæ aut truncatæ. Stamina 1–3; antheræ lineari-oblongæ, ecristatæ. Nux cum $\frac{1}{2}$–$\frac{3}{4}$ parte glumæ æquilonga aut gluma parum brevior, late ellipsoidea, trigona.

The first 5 species here included are so alike that they require care to sort: *C. Iria*, on the other hand, is placed by both Kunth and Boeckeler with *C. eleusinoides*, which appears to me to differ widely. Though the difference in inflorescence between *C. Iria* and *C. difformis* distinguishes average examples readily, I have met with large numbers of these two species cross-named in herbaria; and there are extreme forms of each species between which the difference is merely one of very small degree. At all events, if *C. Iria* is not placed here, I would not place it with *C. eleusinoides.*

* *Spiculæ fasciculatæ.*

103. C. SILLETENSIS (*Nees in Wight Contrib.* p. 79); culmis cæspitosis; umbella composita, contracta aut capitata; spiculis viridi-fuscis; nuce cum ½ parte glumæ æquilonga, ovoidea, acuta, triquetra.—*Kunth, Enum.* ii. p. 33; *Boeck. in Linnæa*, xxxv. p. 555.

Cyperus, *Wall.! List* n. 3363, F.
Cyperus, *Wall.! List* n. 3536.

Glauco- vel fusco-virens. Radix fibrosa. Culmi plures 1–4 dm. longi, trigoni. Folia 2–3, anguste graminea, cum culmo sæpe æquilonga. Involucri bracteæ 3–5, usque ad 10–18 cm. longæ, divaricatæ. Umbellæ radii 3–10, longi 1–5 cm.; umbellulæ 1–5-radiatæ, congestæ, subebracteatæ. Spiculæ in unoquoque radio 5–15, fasciculatæ, longæ 5–8 mm., latæ 1 mm. et ultra, compressæ, 10–22-floræ. Glumæ imbricatæ, ovatæ, obtusæ, vix carinatæ, 3–5-nerviæ. Stamen 1 (aut 2) inclusum; anthera oblonga, flava, mutica. Stylus nuce brevior; rami 3, e gluma vix exserti. Nux brunnea.—Species formis majoribus *C. pumili*, Linn., similis, et cum hac in herbariis admixta.

Bengalia orientalis, ab Assam usque ad Martaban, alt. 0–500 metr., sat communis.

Assam: Suddiya (*Griffith* nn. 1029, 1474, *h. Kew* n. 6212, n. 1474, *h. Mus. Brit.*); Seebsagur et Gowhatty (*Masters in h. Calcutta*); colles Naga (*Masters* n. 1883, *h. Calcutta*).

Bengalia orientalis (*Griffith* n. 1456, *h. Kew* n. 6166, n. 6166 *hh. Calcutta, Mus. Brit.*); Cachar (*Keenan, h. Kew*); Dacca (*C. B. Clarke* nn. 6747, 6885, 17076, 17106, &c.).

Bengalia borealis: Rungpore et Siligori (*C. B. Clarke* nn. 12068, 26510, 26793, &c.).

Burma: Pegu, in convalle Sittang (*Kurz* n. 2679, *h. Calcutta*); Martaban et Tonkhyeghat (*Kurz* n. 653, *h. Calcutta*); Rangoon (*Cleghorn* n. 215, *h. Calcutta*).

104. C. PULCHERRIMUS (*Willd.*; *Kunth, Enum.* ii. p. 35); culmis cæspitosis; umbella composita aut decomposita, densa aut sublaxa; spiculis parvis, viridi-fuscis; glumis ovato-oblongis, apicibus in sicco incurvis; nuce cum ½ parte glumæ æquilonga, ellipsoidea, utrinque conico-acutata, triquetra.—*Boeck. in Linnæa*, xxxv. p. 573.

C. eumorphus, *Steud.*! *Cyp.* p. 22.
C. silletensis, *Thwaites*! *Enum. Pl. Zeyl.* p. 343.
C. Haspan, *Benth. Fl. Austral.* vii. p. 270 partim, *non Linn.*
Cyperus, *Wall.*! *List* n. 3357.

C. silletensis forsan varietas.—Spiculæ quam hujus angustiores, vix 1 mm. latæ. Spicularum fasciculi (in exemplis bene evolutis) in radiolis longiusculis sustenti.—In h. Kew in ipsissima plagula cum *C. Haspan* agglutinata commixta, ideoque ad *Cyperum Haspan* a Bentham relata.

Assam: Suddiya (*Griffith* nn. 1035, 1480, *h. Kew* n. 6173; *Jenkins* n. 565, *h. Kew*).
Zeylania (*Thwaites, C. P.* n. 3558, *hh. Kew, Mus. Brit., Calcutta*).
Java (*Zollinger* n. 638, *hh. Kew, Mus. Brit.*; *Horsfield, h. Mus. Brit.*).
Borneo: Banjarmassing (*Motley* n. 992, *h. Kew*).

105. C. DIFFORMIS (*Linn. Amœn. Acad.* iv. p. 302, *Sp. Pl.* p. 67); cæspitosa; umbella simplice composita aut capitata; spiculis minimis, dense fasciculatis; glumis ovatis, truncatis, castaneis aut pallescentibus; nuce cum gluma fere æquilonga, æqualiter triquetra, subovoidea, pallida.—*Rottb. Descr. et Ic.* p. 24, t. 9. fig. 2; *Sibth. Fl. Græc.* i. p. 32, t. 46; *R. Br. Prod.* p. 215; *Roxb. Fl. Ind.* i. p. 195; *Nees in Wight Contrib.* p. 88; *Decaisne in Nouv. Ann. Mus. d'Hist. Nat.* iii. p. 358; *Kunth, Enum.* ii. p. 38; *Reich. Ic. Fl. Germ.* t. 284. fig. 674; *Parl. Fl. Ital.* ii. p. 31; *Willk. et Lange, Fl. Hisp.* i. p. 138; *Dalz. & Gibs. Bomb. Fl.* p. 282; *Boeck. in Linnæa,* xxxv. p. 586; *Baker, Fl. Maurit.* p. 411; *Benth. Fl. Austral.* vii. p. 268; *Boiss. Fl. Orient.* v. p. 370.

C. protractus, *Link, Hort. Berol.* i. p. 305, *non* C. fuscus, var. protracta, *Delile.*
Cyperus, *Wall.*! *List* n. 3363 (litt. F excl.).
Cyperacea indeterm., *Wallich h.* n. 3.

Radix fibrosa. Culmi sæpe plures, 1–5 dm., triquetri. Folia 2–3, graminea, culmo sæpius breviora, flaccida, in marginibus minute scabrida. Involucri bracteæ 2–4, usque ad 5–25 cm. longæ, divaricatæ. Umbella sæpius contracta; radii 3–8, usque ad 4 cm. longi; umbellulæ congestæ, ebracteatæ. Spiculæ globoso-fasciculatæ, longæ 5–10 mm., latæ 1 mm., compressæ, subturgidæ, 10–40-floræ; rhachilla subexalata. Glumæ vix imbricatæ, concavæ vix carinatæ, ovatæ aut subovatæ, in dorso virides, 3-nerviæ. Stamen 1, raro 2; anthera parva, subinclusa, oblonga, mutica, flavida. Stylus nuce multo brevior; rami 3, breves. Nux sursum latior, apice obtuse conica, non (aut obscure) a dorso compressa, neque rostrata, nitide straminea; cellulæ extimæ quadratæ, emarcidæ, tenuiter hyalinæ, vix laxæ.

In oryzetis Orbis Veteris, ab Hispania usque ad Japoniam, Australiam, Africam australem.

Hispania: Valentia *fide Willkomm et Lange.*

Italia: forsan cum oryza introducta e Parlatore; Parma (*J. Gay, h. Kew*); Piedmont (*h. Mus. Brit.*); Sicilia (*Todaro* n. 927, *hh. Mus. Brit., Calcutta*).

Egypt: Rosetta (*Sieber* n. 5, *h. Kew*; *Letourneux* n. 148, *h. Kew*); Fossa Egyptiaca (*Sarguet* n. 723, *h. Mus. Brit.*).

Russia meridionalis: Lenkoran (*Hohenacker, h. Mus. Brit.*); Armenia Rossica (*Besser, h. Kew*); Ussuri (*Maximowicz, h. Kew*); Japonia (*Oldham* n. 901, *hh. Kew, Calcutta*).

India orientalis: alt. 0–2600 metr., ab Himalaya usque ad Zeylaniam et Malaccam vulgaris; Cabul (*Griffith* nn. 191, 892 partim, *h. Kew* n. 6165); Kashmir, alt. 2600 metr. (*Jacquemont* nn. 722, 827, *h. Kew*); Kumaon (*Wallich* n. 3363 H, *h. Calcutta*); Assam (*Masters* n. 206, *h. Kew*; *Simons &c., h. Calcutta*); Oudh (*R. Thompson* n. 360, *h. Calcutta*); mons Aboo (*G. King, h. Calcutta*); India centralis (*G. King* n. 49, *h. Calcutta*); Poonah (*Jacquemont* n. 275, *h. Kew*); Canara (*Hohenacker* n. 821, *h. Kew*); Madras Peninsula (*Wight* n. 2884, *h. Calcutta*); Zeylania (*Thwaites C. P.* n. 3042, *hh. Mus. Brit., Calcutta*).

Burma superior et Tenasserim (*Griffith* n. 6165, *hh. Kew, Calcutta*); Ava (*Wallich* n. 3363 B, *h. Calcutta*); Pegu (*Kurz* nn. 657, 2678, *h. Calcutta*); Rangoon (*R. Scott, h. Calcutta*).

China borealis: Shantung (*Maingay* n. 87, *h. Kew*, n. 158, *h. Calcutta*).

Formosa (*Oldham* n. 582, *hh. Kew, Mus. Brit.*).

Canton (*Sampson* n. 464, *h. Kew*); Shanghai (*Maingay* n. 546, *h. Calcutta*); Hongkong (*C. Wright* n. 558, *h. Kew*).

Ins. Philippine (*Cuming* n. 549, *hh. Kew, Mus. Brit.*).

Isle of Pines (*MacGillivray* n. 771, *h. Kew*).

New Caledonia (*Vieillard* n. 1437, *h. Kew*; *Pancher, h. Mus. Brit.*).

Timor (*Le Guillon, h. Kew*).

Java (*Zollinger* n. 433, *h. Kew*; *Horsfield* nn. 1014, 1081, *h. Mus. Brit.*); Buitenzorg (*Kurz* n. 1851, *h. Calcutta*).

Australia: Victoria (*F. Mueller, h. Kew*); flumen Brisbane (*F. Mueller, h. Calcutta*); Australia subtropicalis (*Bidwill* n. 141, *h. Kew*); sinus Moreton (*F. Mueller, hh. Kew, Mus. Brit.*); sinus Rockingham (*Dallachy, h. Kew*); sinus Keppel (*R. Brown* n. 5906, *hh. Kew, Mus. Brit.*); Baloon flumen (*Mitchell, h. Mus. Brit.*); Murray flumen (*F. Mueller, h. Mus. Brit.*).

Africa australis: Grahamstown (*Macowen* n. 1347, *hh. Kew, Mus. Brit.*); Cap. Bonæ Spei (*Drège, h. Mus. Brit.*); Dammara-land (*Een, h. Mus. Brit.*); Natal (*Gerrard* n. 702, *h. Kew*; *Burchell* n. 3350, *h. Kew*).

Congo (*Christian Smith* n. 13, *h. Mus. Brit.*).

Ins. S. Thomas (*Don, h. Mus. Brit.*).

Ins. S. Helena (*Burchell* n. 6, *h. Kew*).

Niger flumen (*Baikie, h. Kew*); Djur (*Schweinfurth* n. 2473, *h. Kew*); Nilus superior (*Grant, h. Kew*).

Socotra (*Balfour* n. 472, *h. propr.*).

Mauritius (*Sieber* n. 17, *hh. Kew, Mus. Brit.*; *Bouton*, nn. 4, 5, *h. Kew*).

Madagascar: forma maxima (*Hildebrandt* n. 3425 *hh. Kew, Mus. Brit.*; *Pervillé* nn. 468, 482, *h. Kew*; *Hilsenberg et Bojer, h. Mus. Brit.*).

106. C. FUSCUS (*Linn. Sp. Pl.* p. 69); cæspitosa; umbella simplice composita aut capitata; spiculis minimis, multifloris, dense fasciculatis; glumis ovatis, obtusis, nigro-castaneis aut rubronotatis; nuce cum $\frac{2}{3}$ parte glumæ æquilonga, pallida, ellipsoidea, a dorso compressa, angulata aut carinata, breviter rostrata.—*Fl. Dan.* t. 179; *Host, Gram.* iii. p. 49, t. 73; *Poit. et Turpin, Fl. Paris*, t. 75 (non visa); *Desf. Fl. Atlant.* i. p. 47; *Sibth. Fl. Græc.* i. p. 34, t. 48; *Engl. Bot.* t. 2626; *Sturm, Fl. Deutsch.* xiii. t. 52; *Curt. Fl. Lond.* iv. t. 85; *Koch, Syn. Fl. Germ.* p. 849; *Kunth, Enum.* ii. p. 37; *Reichb. Ic. Fl. Germ.* t. 280. fig. 667; *Gren. et Godr. Fl. France*, iii. p. 360; *Boiss. Voy. Espagn.* p. 626, *Fl. Orient.* v. p. 370; *Ledeb. Fl. Ross.* iv. p. 241; *Parl. Fl. Ital.* ii. p. 27; *Anders. Cyp. Skand.* p. 1, t. 1. fig. 2; *Boeck. in Linnæa*, xxxv. p. 585.

C. ferrugineus, *Forsk. Fl. Æg.-Arab.* p. 14, *non Poir.*

C. Forskalei, *Dietr. Sp. Pl.* ii. p. 251.

—, *Morison, Hist.* iii. p. 239, sect. 8, t. 11. fig. 38.

Cyperacea, *Griff. Itin. Notes,* p. 281, n. 752.
Cyperacea, *Griff. Itin. Notes,* p. 293, n. 892.

Radix fibrosa. Culmi numerosi, 5–25 cm. longi, trigoni. Folia 2–3, graminea, culmo sæpius longiora. Involucri bracteæ 3–6, usque ad 5–15 cm. longæ, divaricatæ. Umbella 3–6-radiata, interdum contracta aut subcapitata; radii usque ad 1–3 cm. longi; umbellulæ congestæ, ebracteatæ. Spiculæ 3–20næ, longæ 8 mm., latæ 1–2 mm., lineari-oblongæ, compressæ, subturgidæ, 12–24-floræ; rhachilla subexalata. Glumæ imbricatæ, obsolete mucronatæ vel omnino obtusæ, compressæ, vix carinatæ, in dorso virides 1- (obscurius 3–5-) nerviæ, in lateribus nigrescentes castaneo-rubræ aut scariosæ. Stamina 2; antheræ vix exsertæ, oblongæ, muticæ. Stylus nuce brevior; rami 3, e gluma breviter exserti. Nux ellipsoidea, inæqualiter trigona, in dorso convexa aut carinata, matura flavide brunnea aut straminea; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, laxiusculæ.

Ab Algiers, Hispania, Anglia, Gothland, per totam Europam, Africam borealem, Asiam occidentalem, usque ad Kashmir vulgata.

Scania: Widstkofte (*Ahlberg, h. Mus. Brit.*).
Podolia (*Rehmann* n. 169, *h. Mus. Brit.*).
Dresden (*Reichenbach, Fl. Germ. Exs.* n. 152, *hh. Kew, Mus. Brit.*).
Tours (*Delaunay* n. 1804*a*, *h. Kew*).
Belgium (*Marchal* n. 346, *h. Mus. Brit.*).
Montpellier (*Bentham, h. Calcutta*).
Treves (*Billot* n. 85, *h. Mus. Brit.*).
Vienna (*Breidler, h. Calcutta*).
Tyrol (*Churchill, h. Mus. Brit.*).
Switzerland (*Shuttleworth, h. Calcutta*).
Portugal (*Welwitsch* nn. 337, 338, 403, *h. Kew,* nn. 150, 338, *h. Mus. Brit.*).
Corsica (*Jordan, h. Mus. Brit.*).
Rome (*E. Forster, h. Mus. Brit.*).
Sicilia (*Todaro, hh. Mus. Brit., Calcutta*).
Mauritania (*Gouan* n. 5, *h. Kew*); Tangier (*Durand* n. 86, *h. Mus. Brit.*); Algeria (*Lefranc* n. 486, *h. Mus. Brit.*).
Alexandria (*Camaritani* n. 3597, *h. Kew*).
Attica (*Orphanides* n. 398, *h. Kew*).
Damascus (*Gaillardot* n. 2297, *h. Kew*).
Tauria (*Compin, h. Calcutta*).

Narym flumen (*Karelin et Kirilow* n. 1069, *hh. Kew, Mus. Brit.*).

Soongaria (*Schrenk, h. Kew*).

Ispahan (*Haussknecht, hh. Kew, Mus. Brit.*).

Cabul (*Griffith* nn. 6174, 6175, 6176, *hh. Kew, Calcutta*).

Kashmir, alt. 1800 metr. (*T. Thomson, hh. Kew, Mus. Brit., Calcutta*); Kishtwar, alt. 1800 metr. (*C. B. Clarke* n. 31383, *h. Kew*).

Var. β. *virescens* (*Vahl, Enum.* ii. p. 336); spiculis majoribus pallidioribus, albo-virescentibus; glumis apice sublanceolatis.—*Reichb. Fl. Germ.* i. p. 72 (sp.), *Ic. Fl. Germ.* t. 280. fig. 668.

C. fuscus, *var.* protracta, *Delile, Fl. Egypt.* p. 8, t. 5. fig. 3.

C. viridis, *Sieb.*; *Spreng. Syst.* i. p. 216.

Regio Mediterranea orientalis: ins. Creta (*Sieber, h. Kew*); Tunis (*Kralik* n. 308, *hh. Kew, Mus. Brit.*); Sidon (*Fox, h. Kew*); Nazareth (*Bové* n. 385, *h. Kew*).

107. C. MICROLEPIS (*Boeck. in Flora*, 1879, p. 551, *non Baker*); cæspitosa, parva, albo-viridis; involucri bracteis 3–5, longis; umbella composita; spiculis parvis, fasciculatis; glumis obovatis, albidis; nuce cum gluma æquilonga, obovoidea, triquetra, apice conica, stramineo-lutea.

C. Afzelii, *Boeck. in Linnæa*, 1879, p. 547 partim.

Culmi 10–15 cm., trigoni. Folia 2–3, angusta, cum culmo sæpe æquilonga. Involucri bracteæ usque ad 10–18 cm. longæ. Spiculæ 8–20-floræ, quam *C. difformis* sæpius breviores, latiores. Glumæ concavæ, rotundatæ.—*C. fusco* var. *virescenti* affinis, differt glumis admodum obtusis.

Africa centralis: Djur (*Schweinfurth* n. 2328, *h. Kew*); Bongo (*Schweinfurth* n. 2195, *h. Kew*); Teba, in flumine Quorra (*Barter, h. Calcutta*).

** *Spiculis laxe spicatis.*

108. C. IRIA (*Linn. Sp. Pl.* p. 67, tab. Rheede cit. excl., *et h. propr.*); umbella simplice aut composita; spiculis multifloris, laxe spicatis; glumis distantibus, obovatis; nuce quam gluma parum breviore, obovoidea, triquetra.—*Rottb. Descr. et Ic.* p. 41 (Ira); *Roxb. Fl. Ind.* i. p. 201; *Nees in Wight Contrib.* p. 87; *Kunth, Enum.* ii. p. 38; *Hassk. Pl. Jav. Rar.* p. 83; *Dalz. & Gibs. Bomb. Fl.* p. 282; *Boeck. in Linnæa*, xxxv. p. 595; *Benth. Fl. Austral.* vii. p. 276 (var. flavescente inclusa); *Boiss. Fl. Orient.* v. p. 370.

C. Santonici, *Rottb. Descr. et Ic.* p. 41, t. 9. fig. 1.
C. panicoides, *Lam. Ill.* i. p. 145.
C. chrysomelinus, *Link, Hort. Berol.* i. p. 305.
C. parviflorus, *Nees! in Wight h. propr.* n. 1840, *in Wight, Contrib.* p. 87, *nec Vahl, nec* C. umbellatus, *Roxb.*
C. seminudus, *Moritz in Zoll. Verz.* 1842–44, p. 96, *nec Roxb.*
C. Diaphaniria, *Steud. Cyp.* p. 23.
C. Microiria, *Steud. Cyp.* p. 23.
C. resinosus, *Steud.! Cyp.* p. 23.
C. microlepis, *Baker! Fl. Maurit.* p. 410, *non Boeck.*
Cyperus, *Wall.! List* n. 3360 (*C. piloso* in distrib. commixto).
Cyperus, *Wall.! List* n. 3361.
Cyperacea, *Griff. Itin. Notes,* p. 14, n. 198.
—, *Pluk. Almag.* t. 191. fig. 7.

Radix fibrosa. Culmi cæspitosi, 1–5 dm., trigoni. Folia 2–3, graminea, subflaccida, cum culmo interdum æquilonga. Involucri bracteæ 3–5, usque ad 1–2 dm. longæ, divaricatæ. Umbella a 5 cm. usque ad 5 dm. in diam.; radii plures, patuli, apice corymbosi aut iterum imperfecte umbellati; umbellulæ corymbosæ; radioli 1-spicati, sæpius brevissimi, ab ochreolo caudati suffulti (ideoque umbella specie simplex spicis subdigitatis) aut elongati 1–3 cm. longi a bracteis usque ad 5 cm. longis suffulti. Spicæ laxissimæ, longæ 1–4 cm., 5–20-spiculosæ; spiculæ antice fasciculatæ, gluma ima inconspicua. Spiculæ longæ 1 cm., latæ 2 mm., compressæ, 6–20-floræ, flavescentes; rhachilla subexalata. Glumæ compressæ, in dorso congestim 3–5-nerviæ, nervo viridi obsolete (raro plane minute) excurrente; latera estriata, scarioso-flavida, sursum latiora. Stamina 2 vel 3; antheræ vix exsertæ, oblongæ, muticæ, flavidæ; filamenta basi subconnexa. Stylus nuce multo brevior; rami 3, e gluma breviter exserti. Nux apice obtuse conica, nigra; cellulæ extimæ quadratæ; emarcidæ, albidæ, retiformes.—Rheede, Hort. Mal. a Linnæo multisque auctoribus citata, est verisimiliter *C. procerus,* Rottb., certe non *C. Iria,* Linn.—*C. Iria,* var. *flavescens,* Benth. Fl. Austral. vii. p. 276, est omnino *C. Iria,* Linn., neque ullo modo *C. flavescentem,* Linn., versus tendit.—*C. Iria,* var., Hance h. n. 1147, est forma explicata amabilis, glumis submucronatis.

In Asia orientali cum Malaya, Australia, in oryzetis pestis; in Asia australi-occidentali et Africa tropicali frequens.

Per Indiam ubique, a mari usque ad 2200 metr. alt.: Almora, alt. 1200 metr. (*Strachey et Winterbottom* n. 10, *h. Mus. Brit.*); Mussoorie (*G. King, h. Calcutta*); Nepaul (*Wallich*

n. 3360 G, *h. Calcutta*); Sikkim (*T. Anderson* n. 1343, *h. Calcutta*); Sonada, alt. 2200 metr. (*Kurz, h. Calcutta*); Assam (*Masters* nn. 200, 570, *h. Kew*, nn. 352, 417, 643, *h. Calcutta*; *Jenkins, Simons, &c., h. Calcutta*); Khasia colles (*Griffith* n. 198, *h. Calcutta*); Lucknow (*Bonavia* nn. 229, 237, *h. Calcutta*); Parasnath, alt. 450 metr. (*C. B. Clarke* n. 24914); Chota Nagpore (*Wood* n. 14, *h. Calcutta*); India centralis et mons Aboo (*G. King, h. Calcutta*); Poona (*Jacquemont* n. 344, *h. Kew*); Mangalore (*Hohenacker* n. 188, *h. Kew*); Quilon (*Wight* nn. 2869, *hh. Kew, Calcutta*); Zeylania (*Thwaites, C. P.* n. 811, *hh. Kew, Mus. Brit., Calcutta*).

Peninsula Malayana: Burma et Mergui (*Griffith* n. 6178, *hh. Kew, Calcutta*); Yunan, Hotha (*J. Anderson, h. Calcutta*); Segain (*Wallich* n. 3360 H, *h. Calcutta*); Arracan (*Kurz, h. Calcutta*); Pegu (*R. Scott, h. Calcutta*; *Kurz* nn. 675, 2677, *h. Calcutta*); Singapore (*Kurz* n. 3003, *h. Calcutta*); ins. Andaman et Nicobar (*Kurz, h. Calcutta*).

Japonia (*Oldham* nn. 193, 903, *h. Kew*; *Buerger, h. Calcutta*); Yokohama (*Bisset* n. 818, *h. Mus. Brit.*).

China: Pekin (*Hance* n. 1147, *hh. Kew, Calcutta*); Shanghai (*Maingay* nn. 635, 636, *hh. Kew, Calcutta*, n. 759, *h. Calcutta*); Hongkong (*C. Wright* n. 559, *h. Kew*); Canton (*Sampson* n. 259, *h. Kew*); Formosa (*Oldham* n. 903, *h. Kew*, n. 585, *h. Mus. Brit.*).

Ins. Philippine (*Cuming* n. 563, *hh. Kew, Mus. Brit.*).

Java (*Horsfield* nn. 1013, 1057, *h. Mus. Brit.*; *Zollinger* nn. 74, 77, *h. Mus. Brit.*); Buitenzorg (*Kurz* n. 1852, *h. Calcutta*).

Borneo (*Barber* n. 52, *h. Kew*; *Motley* n. 620, *h. Kew*).

Australia borealis: Sturt's Creek (*F. Mueller, h. Kew*); Portus Darwin (*Fitzalan, h. Kew*).

Australia centralis (*Gosse* n. 11, *h. Kew*).

Cabul (*Griffith* nn. 42, 96, *h. Kew* n. 6177, *h. Calcutta*); Persia (*Haussknecht, hh. Kew, Mus. Brit.*).

Ins. Mauritius (*Bouton, h. Kew*; *J. Grey, h. Kew*; *Bojer, h. Mus. Brit.*).

Ins. Mascarene (*Macgregor, h. Mus. Brit.*).

Africa: Nubia (*Kotschy* n. 267, *hh. Kew, Mus. Brit.*); Darfur (*Pfund* n. 624, *h. Kew*); Cordofan (*Pfund* n. 335, *h. Kew*); Djur (*Schweinfurth* n. 2281, *h. Kew*).

Sect. L. *Glomerati.*

Majusculi, foliati. Radix fibrosa, valida, rarius lignosa. Culmus sæpissime solitarius, trigonus, apice triqueter. Umbella composita aut decomposita, spicis numerosis, approximatis, multispiculosis. Spiculæ multifloræ, compressæ; rhachillæ alæ conspicuæ, persistentes. Glumæ laxiuscule imbricatæ, ovatæ aut ellipsoideæ, obtusæ. Stamina 3; antheræ lineari-oblongæ, muticæ, rarius apice obsolete cristatæ, sanguineæ. Nux cum $\frac{1}{4}$–$\frac{2}{3}$ parte glumæ æquilonga, ellipsoidea aut oblonga, apice sæpe angustata, trigona, haud raro inæqualis, interdum curvata.

From this point till we come to the Exaltati there is a long series of species which I cannot divide into any satisfactory sections; but, to avoid one inconveniently long string of species, I have arranged them pretty much as Boeckeler has left them.

Boeckeler has placed *C. distans* as an anomalous species, but I cannot sort it satisfactorily even as a species from *C. nutans*; and Boeckeler calls *Sieber* n. 18, *C. distans*, whereas I think if there is a typical *C. nutans*, that is it. Boeckeler places *C. spectabilis* very near *C. eleusinoides*, but arranges *C. glomeratus* itself with *C. Sorostachys* (*leucocephalus*, Retz.), which I think is certainly not the true affinity; indeed *C. spectabilis* has been issued from Kew as a mere form of *C. glomeratus*, and I think it is excessively near it.

Benth. et Hook. f. Gen. Pl. iii. p. 1045, have followed Kunth in making their large sections (subgenera) depend upon the development and persistence of the wing of the rhachilla: this, as stated in the introduction, I think is impossible to work; and, so far as it can be worked, leads to most unnatural combinations. In species like *C. rotundus*, of which we have abundant material, it is seen that the wing is generally *finally* soluble: the point of age at which it is soluble appears to be very variable, and in herbarium specimens depends largely on the method by which the specimen was dried. As regards the breadth of the wing, I doubt its value as a *subgeneric* character: *C. cephalanthus* is arranged next *C. spectabilis* by Hooker f., and I incline to think that its true affinity, but the wings of the rhachilla in *C. cephalanthus* are orbicular, perhaps broader than in any other species of *Eucyperus*; so that Boeckeler has removed it to quite another place. Finally we see, in common species like *C. longus* and *C. tegetum*, very great difference in the breadth of the wing in one species.—The

arrangement here followed is, I hope, tolerably natural as to the East-Indian species.

109. C. GLOMERATUS (*Linn. Amœn. Acad.* iv. p. 301; *Sp. Pl.* p. 68); umbella composita; spiculis in spicas densissimas breviter cylindricas congestis; glumis elliptico-oblongis obtusis, ferrugineis; nuce cum ⅔ parte glumæ æquilonga, angusta, trigona.—*Host, Gram.* iii. p. 48, t. 71; *Sturm, Fl. Deutschl.* xiii. t. 52; *Reichb. Ic. Fl. Germ.* t. 284. fig. 675; *Kunth, Enum.* ii. p. 77; *Koch, Syn. Fl. Germ.* p. 850; *Ledeb. Fl. Ross.* iv. p. 242; *Parl. Fl. Ital.* ii. p. 31; *Boeck. in Linnæa,* xxxv. p. 592.

C. cinnamomeus, *Retz. Obs.* iv. p. 10.
C. australis, *Schrad. Fl. Germ.* i. p. 116; *Mertens et Koch, Deutsch. Fl.* i. p. 424.
—, *Seguier, Verona,* iii. p. 68, t. 2. fig. 2.
—, *Monti, Gram.* p. 14, t. 1. fig. 1.

Radix fibrosa. Culmus solitarius (vel 2–3 fasciculati), robustior, 3–10 dm. longus, obtuse (apice subacute) trigonus. Folia 2–5, cum culmo sæpe æquilonga, 5–8 mm. lata, plana, in marginibus serrulato-scabra. Involucri bracteæ 3–5, usque ad 2–3 dm. longæ. Umbellæ radii 3–8, usque ad 6–12 cm. longi (umbella interdum congesta vel subcapitata); umbellularum radioli pauci, brevissimi; bracteolæ 2–3, usque ad 4 cm. longæ, foliaceæ. Spicæ longæ 2 cm., latæ 15 mm., spiculis usque ad 40–80, densissimæ. Spiculæ longæ 12 mm., latæ 1 mm., maturæ undique divaricatæ, compressæ, 12–20-floræ. Glumæ laxe imbricatæ, vix carinatæ, fere concolores, in dorso tenuiter 3–5-nerviæ; rhachillæ alæ lanceolatæ, hyalinæ, conspicuæ, insolubiles. Stamina 3, vix exserta; antheræ parvæ, oblongæ, ferrugineæ, muticæ. Stylus nuce multo brevior; rami 3, breviter exserti. Nux utrinque breviter angustata, fusco-atra; cellulæ extimæ quadratæ, emarcidæ, nitidæ, hyalinæ, persistentes.

Ab Italia usque ad Kashmir et Amurland: Verona (*Reichenbach* n. 2310, *h. Kew*).
Adriatic: Aquileia (n. 6, *h. Calcutta*).
Croatia (*Farkas-Vukotinovič* n. 859, *h. Calcutta*).
Iberia (*Wilhelms, h. Calcutta*).
Mare Caspium (*Karelin* n. 311, *h. Kew*; *Schrader, h. Calcutta*).
Kashmir: prope Sonamurg, alt. 2000 metr. (*T. Thomson, hh. Kew, Mus. Brit., Calcutta*).
China borealis: Shantung (*Maingay* n. 155, *h. Calcutta*).

Ussuri (*Maack, h. Kew*).
Amurland (*Bunge, h. Kew*).

110. C. SPECTABILIS (*Schreb.*; *Kunth, Enum.* ii .p. 73); umbella specie simplice, revera composita; umbellulis e spicis densissime congestis; spiculis compressis, laxiuscule 12-floris; glumis late ellipticis, submucronatis; nuce angustius obovoidea, trigona, apice acutata, subrostrata, cum ½ parte glumæ æquilonga.—*Boeck. in Linnæa*, xxxv. p. 605.

Texas: Drummond (*h. Calcutta*).

111. C. SIEBERI (*Kunth, Enum.* ii. p. 96); umbella parce composita; spicis in radiis longiusculis sustentis, stellatis, subglobosis; spiculis oblongis, compressis, 6–10-floris, læte cinnamomeo-brunneis; glumis late ovatis, obtusis, mucrone brevissime excurrente.—*Boeck. in Linnæa*, xxxv. p. 508.

[This is placed hereabout by Boeckeler, nor do I know that it technically may not belong to this section; but it is remote in habit both from the species that go before and those that go after.]

Victoria (*Robertson, h. Calcutta*).

112. C. ELEUSINOIDES (*Kunth, Enum.* ii. p. 39); umbella composita, radiis elongatis; spicis multispiculosis, laxis, sæpe subfasciculatis; glumis vix imbricatis, nervosis, submucronatis; nuce cum ⅔ parte glumæ æquilonga, oblonga, curvata, trigona, in facie interiore concava.—*Boeck. in Linnæa*, xxxv. p. 596; *Benth. Fl. Austral.* vii. p. 277; *Boiss. Fl. Orient.* v. p. 371.

C. xanthopus, *Steud. in Flora*, 1842, p. 595; *A. Rich. Fl. Abyss.* ii. p. 485; *Thwaites, Enum. Pl. Zeyl.* p. 344.
C. infra-apicalis, *Nees in h. Wight* n. 2382; *Aitch. Cat. Punjab Pl.* p. 155.
C. Santonici, *Rottler h. propr., non Retz.*
C. racemosus, *Dalz. h. propr., non Retz.*
Cyperus, *Wall.*! *List* n. 3346.
Cyperacea indeterm., *Wallich h.* n. 2.
Cyperacea, *Griff. Itin. Notes*, p. 322, n. 1267.

Radix fibrosa. Culmus 5–10 dm. longus, solitarius (basi autem sæpe progemmans ideoque culmi 1–3ni), trigonus, sursum triqueter. Folia plura, robusta, sæpe cum culmo fere æquilonga, 5–8 mm. lata, plana, in marginibus minute scabra. Involucri bracteæ 3–6, usque ad 2–5 dm. longæ, divaricatæ. Umbellæ radii 6–8, longi 1–2 (rarius 3) dm.; ochreæ 1–2 cm. longæ; umbellularum bracteolæ longæ; radioli breves (sæpe subnulli), paucispicati. Spicæ 1–4 cm. longæ, 5–25-spiculosæ, spiculis fusco-viridibus, maturis brunneis, adscendentibus neque ullo tempore divaricatis. Spiculæ longæ 10–14 mm., latæ 3 mm., compressæ, 14–22-floræ; rhachillæ alæ late lanceolatæ, hyalinæ, persistentes; glumæ 2 imæ breves, quadratæ. Glumæ paullo remotæ, compressæ, vix carinatæ, obtusæ, 7–11-nerviæ, in dorso virescentes, nervo dorsali interdum breviter excurrente. Stamina 3, subinclusa; antheræ lineari-oblongæ, non aut minute albo-cristatæ, fusco-rubræ. Stylus ⅓ parte nucis brevior; rami 3, exserti. Nux utrinque breviter angustata, nigro-brunnea; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, persistentes, minute porosæ.

India Orientalis; China; Australia; Africa tropicalis.

India Orientalis, alt. 0–1500 metr., in regionibus occidentalibus a Kashmir usque ad Zeylaniam sat vulgaris: Cabul (*Griffith* nn. 28, 1267, *h. Kew*, n. 6167, *h. Calcutta*); montes Suleiman (*Dr. Sanders, h. Calcutta*); Punjab (*T. Thomson, hh. Kew, Calcutta*; *Aitchison* n. 244, *h. Kew*; *Stewart* nn. 294, 384, *h. Calcutta*); Dehra Doon (*Jacquemont* n. 410, *h. Kew*); Moradabad (*T. Thomson* n. 399, *hh. Kew, Mus. Brit.*); India centralis (*G. King* n. 20, *h. Calcutta*); Sangur (*Vicary, h. Calcutta*); Chota Nagpore (*C. B. Clarke* nn. 20423, 21220, &c.); Bombay (*Dalzell, h. Kew*); Coimbatore (*C. B. Clarke* n. 11525); montes Nilghiri (*G. Thomson, h. Calcutta*); Zeylania (*Thwaites, C. P.* n. 3044, *hh. Calcutta, Mus. Brit.*).

China: Canton (*Hance* n. 19311, *h. Kew*).

Australia: Portus Darwin (*Fitzalan, h. Kew*).

Africa tropicalis: Abyssinia (*Schimper* nn. 1021, 1155, *hh. Kew, Mus. Brit.*); Ethiopia (*Kotschy* n. 528, *h. Kew*); Gallabat (*Schweinfurth* n. 2005, *hh. Kew, Mus. Brit.*).

113. C. NUTANS (*Vahl, Enum.* ii. p. 363); umbella composita aut decomposita; spicis multispiculosis, elongatis, laxis; glumis remotis, ellipticis, obtusis; nuce cum ¾ parte glumæ æquilonga, vix curvata, trigona, in facie interiore non (aut obscure) concava. —*Kunth, Enum.* ii. p. 94; *Boeck. in Linnæa*, xxxv. p. 597.

C. Jacquini, *Schrad. in Ind. Sem. Goettingen*, 1835, p. 5, *in Linnæa*, 1837, *Litter.-Bericht.* p. 87; *Fenzl in Denksch. Akad. Wissen.* 1854, p. 54, t. 1.

C. exaltatus, *Strachey, Kumaon Pl.* p. 74, *non Retz.*

C. distans, *Baker, Fl. Maurit.* p. 411 partim; *Hook. Niger Fl.* p. 551; *Boeck. in Linnæa*, xxxv. p. 612 partim (*quoad Sieber* n. 18).

Cyperus sp. n. 54, *Herb. Ind. Or., Hook. f. et T. Thoms.*

Radix fibrosa, valida sæpe progemmans (culmis 1–3nis), haud raro lignosa, horizontalis, breve crassa, interdum elongata, descendens. Umbella sæpe magna, usque ad 1 metr. in diam.; radii elongati cum spicis nutantes. Glumæ parum compressæ, concavæ, obscurius nervosæ.—Species a *C. eleusinoide* ope notarum supra datarum difficillime distinguenda; in herbariis etiam cum *C. distante* confusa quæ differt spiculis angustioribus, maturis divaricatis, vix aliter.

India orientalis, alt. 0–1500 metr., late sparsa; China; insula Mascarensia.

India: Sutledge flumen, Rampore (*T. Thomson, h. Kew*); Gurwhal (*G. King, h. Calcutta*); Kumaon, Almora (*Strachey et Winterbottom* n. 8, *hh. Kew, Mus. Brit.*); Sikkim (*J. D. Hooker, h. Kew*; *C. B. Clarke* n. 8899; *Kurz, h. Calcutta*); Assam (*Simons, Jenkins, h. Calcutta*); Khasia colles (*Griffith, h. Kew* n. 6156); Cachar (*Keenan, h. Kew*); Monghyr (*Wallich* n. 3347 B, *h. Calcutta*); Rajmehal (*Kurz, h. Calcutta*); Bombay (*Dalzell, h. Kew*); Mysore vel Carnatic (*G. Thomson, hh. Kew, Calcutta*); Coorg (*Hohenacker* n. 2399, *h. Mus. Brit.*); montes Anamallay et Pulney (*Beddome, h. propr.*); Zeylania, Dambool (*Thwaites, C. P.* n. 3844, *hh. Kew, Mus. Brit.*).

China: Canton (*Hance* n. 19311, *h. Calcutta*).

Madagascar (*Boivin, h. Kew*).

Mauritius (*Sieber* n. 18, *hh. Kew, Mus. Brit.*; *Bojer, h. Kew*).

Rodriguez (*Balfour, hh. Kew, Mus. Brit.*).

Seychelles (*Horne* nn. 216, 646, *h. Kew*; *Bouton* G. 22, *h. Kew*).

114. C. DISTANS (*Linn. f. Suppl.* p. 103); umbella composita; spiculis spicatis, anguste linearibus, multifloris, maturis divaricatis; glumis distantibus, oblongis, obtusis; nuce oblonga, cum $\frac{1}{2}$–$\frac{2}{3}$ parte glumæ æquilonga.—*Jacq. Ic. Pl. Rar.* ii. p. 8, t. 299; *Roxb. Fl. Ind.* i. p. 207; *Beauv. Fl. d'Owar.* i. p. 35, t. 20; *Nees in Wight Contrib.* p. 88; *Kunth, Enum.* ii. p. 93; *Dalz. & Gibs. Bomb. Fl.* p. 283; *Griseb. Fl. Brit. West Ind.* p. 565; *Nees in Mart. Brasil. Cyp.* p. 40; *Baker, Fl. Maurit.* p. 411 partim; *Boeck. in Linnæa,* XXXV. p. 612; *Benth. Fl. Austral.* vii. p. 277.

C. elatus, *Rottb. Descr. et Ic.* p. 37, t. 10; *Steud. Cyp.* p. 49; *Miq.! Fl. Ind. Bat.* iii. p. 284 (*nec Linn., nec* Papyrus elatus, *Nees*).

C. laxus, *Vahl, Enum.* ii. p. 362.
C. squamulatus, *Steud.*! *Cyp.* p. 49.
C. graminicolus, *Steud.*! *Cyp.* p. 49.
Cyperus, *Wall.*! *List* n. 3350.
Cyperus, *Wall.*! *List* n. 3366, litt. A, B, C, D, E, F, G.
Cyperacea indeterm., *Wallich h.* n. 8.

Radix fibrosa, interdum brevissime lignescens. Culmus solitarius (aut basi progemmans culmis 2–3nis), 3–8 dm. longus, trigonus, apice triqueter, basi longius a vaginis intectus. Folia 3–6, culmum sæpe superantia, in marginibus scabra. Involucri bracteæ 3–5, usque ad 2–4 dm. longæ, divaricatæ. Umbella sæpe 2–4 dm. in diam.; radii 4–12, usque ad 8–16 cm. longi, divaricato-patuli; ochreæ 10–15 mm. longæ, apice lanceolato-setaceæ, foliæformes; umbellulæ simplices, corymbosæ, nudæ aut iterum umbellatæ a bracteolis longiusculis suffultæ. Umbellulæ ultimæ fere nudæ, divaricatim 3–4-spicatæ. Spicæ 1–4 cm. longæ, 5–30-spiculosæ; rhachis glabra. Spiculæ maturæ rectangulatim patulæ, longæ 12–24 mm., latæ 1 mm., 10–20-floræ, lineares parum compressæ; rhachillæ alæ angustæ, hyalinæ, persistentes. Glumæ admodum remotæ, remote imbricatæ, convexæ vix carinatæ, in dorso leviter viridi-7–9-nerviæ, in lateribus fusco-rubræ, maturæ sæpe pallidæ. Stamina 3, subinclusa; antheræ lineari-oblongæ, muticæ. Stylus brevissimus; rami 3, e gluma breviter exserti. Nux obtusiuscule trigona, apice obtuse conica, nigro-fusca; cellulæ extimæ quadratæ, emarcidæ, albidæ, subnitidæ, persistentes. —*C. nutans*, Vahl, differt spiculis sæpe pedicellatis (vel si mavis spicis ultimis 1-spiculosis), maturis fasciculatim congestis.—*C. distans*, Sieber, Agrost. n. 18, Baker, Fl. Maurit. est *C. nutans*.—*C. distans*, Hook. Niger Fl. p. 551, est *C. dissolutus*, H. B. K.

Regio tropica, in fere tota orbe terrarum vulgata.

India Orientalis, ab Himalaya usque ad Zeylaniam, communis: Kumaon (*Strachey et Winterbottom* n. 12, *h. Kew*); Moradabad (*T. Thomson* n. 1419, *h. Kew*); Assam (*Jenkins* nn. 205, 566, *h. Kew*; *Griffith* n. 1469, *h. Mus. Brit.*; *Masters, h. Calcutta*); Khasia colles, alt. 900 metr. (*Hook. f. et T. Thomson, h. Calcutta*); alt. 1200 metr. (*C. B. Clarke* n. 5345, *h. Calcutta*); Hindoostan (*T. Thomson, h. Calcutta*); Bengalia orientalis (*Griffith* n. 6156, *h. Calcutta*); Madras Peninsula (*Wight* n. 1843, *h. Kew*; *Wallich* n. 3366, B, C, *h. Calcutta*); Zeylania (*Thwaites, C. P.* n. 810, *hh. Kew, Mus. Brit., Calcutta*).

Burma et Malay Peninsula, vulgaris: Hotha et Bhamo (*J. Anderson, h. Calcutta*); Pegu (*Kurz* nn. 651, 652, 683, *h. Calcutta*; *Brandis, h. Calcutta*); Rangoon (*Wallich* n. 3366 G, *h. Calcutta*); Moulmein (*Parish* n. 268, *h. Calcutta*); Mergui (*Griffith* n. 151, *h. Kew*); Attran (*Wallich* n. 3350, *h. Calcutta*); Thyat-Myo (*Eug. Oates, h. Calcutta*); ins. Andaman (*Kurz, h. Kew*); Malacca (*Griffith* n. 6197, *hh. Kew, Calcutta*); Singapore (*Kurz* n. 3001, *h. Calcutta*; *Kunstler* n. 44, *h. Calcutta*).

Malaya: Bangka (*Amand, h. Kew*); Java (*Zollinger* nn. 459, 460, *h. Kew*); Buitenzorg (*Kurz* n. 2740, *h. Calcutta*); Borneo (*Motley* n. 91, *h. Kew*; *Beccari* n. 863, *h. Kew*); Ternate (*Christian Smith, h. Mus. Brit.*).

China: Hongkong (*C. Wright* n. 564, *h. Kew*; *Forbes, h. Mus. Brit.*).

Ins. Formosa (*Campbell, h. Mus. Brit.*).

Ins. Philippine (*Cuming* n. 444, *hh. Kew, Mus. Brit.*).

Australia: Rockingham sinus (*Dallachy, h. Kew*); Herbert flumen (*Bowman, h. Kew*).

Madagascar (*Pervillé* n. 473, *h. Kew*); Mauritius (*Sieber* n. 13, *hh. Kew, Mus. Brit.*; *Bojer, h. Calcutta*); ins. Joanna (*Bojer, h. Kew*); ins. Bourbon (*Balfour, h. Kew*); ins. Comoro, (*Hildebrandt* n. 1737, *h. Kew*).

Africa: Natal (*Buchanan* nn. 19, 20, *h. Kew*); Zanzibar (*Kirk, h. Kew*); Abyssinia (*Schimper* n. 176, *hh. Kew, Mus. Brit.*); Ukamba (*Hildebrandt* n. 2656, *h. Kew*); Djur (*Schweinfurth* n. 2314, *h. Kew*).

Ins. S. Helena (*Cuming* n. 2464, *hh. Kew, Mus. Brit.*; *Melliss* nn. 132, 161, *h. Kew*).

America: Brazil (*Gardner* n. 859, *h. Kew*; *Martius* n. 250, *h. Kew*; *Burchell* nn. 1070, 1506, 1513, 2745, 4319, *h. Kew*); Guayaquil (*Jameson* n. 551, *hh. Kew, Mus. Brit.*).

Ins. S. Thomas (*Toepffer* n. 145, *h. Kew*).

Jamaica (*Swartz, h. Mus. Brit.*).

Sect. M. *Marginati.*

Marginati, *Boeck. in Linnæa*, xxxv. p. 598, pro magna parte.—Proceri, *Kunth, Enum.* ii. p. 72 pro majore parte.

Majusculi, foliati. Radix fibrosa, valida, aut rhizoma repens vel stoloniferum. Culmus sæpissime solitarius, deorsum complanatus, sursum acute triqueter, apice (exsiccatus) faciebus 3 concavis. Umbella composita aut decomposita (in pluribus speciebus interdum depauperata vel congesta). Spiculæ spicatæ, compressæ, multifloræ; rhachillæ alæ angustissimæ. Glumæ concavæ, ellipticæ, obtusæ (nisi in *C. benghalensi*). Stamina 3; antheræ lineari-oblongæ, muticæ. Nux obovoidea aut oblonga, trigona aut triquetra, apice sæpe acuta.—Species Asiaticæ, cum unica Madagascarica.

This section is made up of four species evidently closely allied, and *C. benghalensis* (nov. sp.) which perhaps should not be placed here, and differs a good deal. The two common plants *C. pilosus* and *C. procerus* (here treated as conglomerate species) have each a very great range in habit and development, and yet are very difficult to separate from each other.

115. C. MALACCENSIS (*Lam. Ill.* i. p. 146); foliis brevibus; umbella composita aut decomposita; glumis remotiusculis, concavis, marginibus apiceque (in sicco) incurvatis; nuce cum $\frac{3}{4}$ parte glumæ æquilonga, anguste oblonga.—*Vahl, Enum.* ii. p. 353; *Kunth, Enum.* ii. p. 74; *Boeck. in Linnæa*, xxxv. p. 603; *Boiss. Fl. Orient.* v. p. 372 (syn. *C. Enodi* excl.).

C. monophyllus, *Vahl, Enum.* ii. p. 352.
C. Pangorei, *Roxb. Hort. Beng.* p. 6, *Fl. Ind.* i. p. 202 (*non Rottb. Descr. et Ic.* p. 31, t. 7. fig. 3).
C. incurvatus, *Roxb.*! *Fl. Ind.* i. p. 196, *Ic. ined.* t. 2016 *in h. Kew.*
C. spaniophyllus, *Steud.*! *Syn.* p. 21; *F. Muell. Fragm. Phyt. Austral.* viii. p. 260.
C. tegetiformis, *Benth. Fl. Austral.* vii. p. 278, *non Roxb.*
C. gangeticus, *Roxb. Ic. ined.* n. 1111, *h. Kew.*
Cyperus, *Wall.*! *List* n. 3329, litt. M, N.
Cyperus, *Wall.*! *List* n. 3332, litt. C partim.
Cyperus, *Wall.*! *List* n. 3342, litt. C partim.
Cyperus, *Wall.*! *List* n. 3351 A (=C. gangeticus, *h. Roxb.*).
Cyperus sp. n. 36, *Herb. Ind. Or., Hook. f. et T. Thoms.*

Rhizoma repens, crassiusculum, a vaginis brevibus nigro-fuscis ovatis acutis intectum; stolones flaccidi, tenues, elongati interdum adduntur. Culmi parum distantes, 5–10 dm. longi. Folia 3–4; vaginæ longæ, arctæ, culmum usque ad 15–20 cm. sæpe integentes; foliorum laminæ lineari-lanceolatæ, vaginis sæpe breviores, $\frac{1}{2}$ partem culmi rarius superantes, interdum brevissimæ, in margine fere leves. Involucri bracteæ 2–4, divaricatæ, cum umbella sæpius subæquilongæ. Umbellæ radii 3–12, 2–4 cm.

longi aut usque ad 10–13 cm. elongati, apice subcorymbosim umbellulati; ochreæ 10–15 mm. longæ; umbellæ contractæ aut subcapitatæ (=*C. incurvatus*, Roxb.) aliquando reperiuntur. Umbellulæ simplices, vel interdum umbellati; bracteolæ parvæ. Spicæ 1–2 cm. longæ, 4–16-spiculosæ, rhachis glabra. Spiculæ patulæ, lineares, subteretes, cinereæ, longæ 15–22 mm., latæ 1–2 mm., 20–40-floræ; rhachillæ alæ angustæ, persistentes. Glumæ non carinatæ, obscurius 5–7-nerviæ. Stamina 3, subinclusa; filamenta subpersistentia; antheræ lineari-oblongæ, muticæ. Stylus brevissimus; rami 3, e gluma fere omnino extrusi. Nux –4plo longior quam lata, apice acuta, trigona, nigro-fusca; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, obscuræ.—*C. enodis*, Boeck., huc a Boiss. adductus, multum differt culmo obtuse trigono, rhachillæ alis latis, nuce obovoidea &c.

Asia australi-orientalis cum Malaya, in æstuariis frequens.

Persia: Basorali (*Haussknecht, h. Kew*); ins. Karakin (*Noe* n. 398, *h. Kew*).

Bengal: Noakhali (*J. D. Hooker, h. Kew*); Calcutta (*Kurz, h. Calcutta*); Soonderbun (*C. B. Clarke*); Bengal orientalis (*Griffith, h. Kew* n. 6206; *Wallich* n. 3342 C, *h. Calcutta*); Dacca (*C. B. Clarke* n. 16958, *hh. Kew, Calcutta*; *Keenan, h. Kew*).

Peninsula Malayana: Pegu (*Kurz, h. Calcatta*); Arracan in ripis fl. Coladyne (*Kurz, h. Calcutta*); Mergui (*Griffith* n. 317, *h. Kew* n. 6147); Singapore (*Kunstler* n. 106, *h. Calcutta*).

Japonia (*Dickens, h. Kew*).

China (*Fortune* n. 7, *hh. Kew, Mus. Brit.*).

Cochinchina (*Lebœuf, h. Kew*).

Ins. Lombok (*Wallace, h. Kew*).

Borneo (*Motley* n. 1294, *h. Kew*).

Australia: Victoria flum. (*F. Mueller, h. Kew*).

116. C. PILOSUS (*Vahl, Enum.* ii. p. 354); foliata; umbella simplice aut composita, umbellulis congestim corymbosis; spicis elongatis, rhachi pilosa; spiculis undique divaricatis; glumis ovatis, concavis, obtusis, plurinerviis, in margine scariosis; nuce cum $\frac{1}{2}$–$\frac{2}{3}$ parte glumæ æquilonga, obovoidea, apice acuta, acute triquetra.—*Kunth, Enum.* ii. p. 80; *Thwaites, Enum. Pl. Zeyl.* p. 344; *Boeck. in Linnæa*, xxxv. p. 598 (syn. *C. procero* excl.); *Benth. Fl. Austral.* vii. p. 275.

C. fimbriatus, *Nees! in Wight Contrib.* p. 86; *Kunth, Enum.* ii. p. 100; *Miq. in Ann. Mus. Lugd.-Bat.* ii. p. 142.
C. marginellus, *Nees! in Wight Contrib.* p. 86; *Kunth, Enum.* ii. p. 75; *Hook. et Arn. Bot. Beechey Voy.* p. 222; *Miq. in Ann. Mus. Lugd.-Bat.* ii. p. 141.
C. honestus, *Kunth! Enum.* ii. p. 74.
C. pauciflorus, *Steud.! Cyp.* p. 34.
C. hebes, *Steud. Cyp.* p. 315.
C. piptolepis, *Steud.! Cyp.* p. 40; *Miq. Fl. Ind. Bat.* iii. p. 279.
C. subalatus, *Steud. Cyp.* p. 31.
C. Wallichii ?, *Wight in h. propr.* n. 2390; *Wallich in h. propr. partim, non Nees.*
Cyperus, *Griff. Itin. Notes,* p. 27, n. 422.
Cyperus, *Wall.! List* n. 3334.
Cyperus, *Wall.! List* n. 3342, litt. C partim.
Cyperus, *Wall.! List* n. 3336, litt. E.
Cyperus, *Wall.! List* n. 3348.
Cyperus, *Wall.! List* n. 3355, litt. D, E, F, G, H, I.
Cyperacea indeterm., *Wallich h.* n. 9.
Cyperacea, *Griff. Itin. Notes,* p. 89, n. 1313.

Radix fibrosa. Culmus solitarius (e basi haud raro progemmans), 3–8 dm. longus, apice acute triqueter. Folia 3–5, valida, cum culmo sæpe æquilonga, in marginibus serrulato-scabra. Involucri bracteæ 3–5, usque ad 2–4 dm. longæ, divaricatæ, in marginibus acriter scabræ etiamque sæpe plus minus (in *C. fimbriato* conspicue) pilosæ. Umbellæ radii 3–8, usque ad 10–15 cm. longi (sæpius 1–5 cm.); ochreæ usque ad 3–5 cm. longæ; umbellulæ sæpius abbreviatim corymbosæ, 3–10-spicatæ; radioli sæpe 1-spicigeri, raro elongati, divisi. Spicæ 1–6 cm. longæ, 10–40-spiculosæ; rhachis (in formis typicis vulgatisque) præsertim secus angulos fulvo-pilosa, in forma maxime australi (=*C. marginello,* sp. Nees) fere glabratæ; spiculæ inter se 0–6 mm. distantes, maturæ rectangulatim divaricatæ, basi a seta subuliformi 2–7 mm. longa sæpissime suffultæ. Spiculæ longæ 10–15 mm., latæ 2 mm., compressæ, 10–24-floræ, pallide rubescentes aut castaneo-brunneæ, in eadem umbella quoad colorem variabiles; rhachilla vix alata. Glumæ fructigeræ vix imbricatæ, ovatæ, obtusæ, concavæ nec carinatæ, in dorso viridi-7–13-nerviæ; latera enervia modo late rubro-scariosa, modo sanguinea, in margine ipso nitide hyalina. Stamina 3, subinclusa; antheræ lineari-oblongæ, muticæ. Stylus brevissimus; rami 3, e gluma breviter exserti. Nux nigra; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, non conspicuæ.—Species polymorpha a rhachi spicarum fusco-pilosa sæpius distinguenda: in *C. procero* autem rhachis interdum subpilosa videtur; contra *C. marginellus,* Nees (mihi forma *C. pilosi*) in h. Kew cum *C. procero* conjunctus erat.

Asia australi-orientalis, cum Malaya, China, Japonia, et Australia tropica.

India Orientalis, alt. 0–1500 metr., ab Himalaya usque ad Zeylaniam, vulgaris: Kumaon (*Strachey et Winterbottom* n. 11, *hh. Kew, Mus. Brit.*); Dehra Dhoon (*G. King, h. Calcutta*); India boreali-occidentalis (*Royle* n. 29, *h. Kew*); Nepaul (*Wallich* n. 3355 H, *h. Calcutta*); Sikkim (*J. D. Hooker, h. Calcutta*; *Kurz, h. Calcutta*); Assam (*Jenkins* n. 197, *h. Kew*); Suddiya (*Griffith, h. Calcutta*); Khasia colles (*Griffith* nn. 422, 1313, *h. Kew* n. 6162 / 1; *J. D. Hooker* n. 1517, *h. Kew*; *Griffith* n. 422, *h. Calcutta*); alt. 1300 metr. (*C. B. Clarke* n. 16154, *h. Calcutta*); Sylhet (*Wallich* n. 3355 E, *h. Calcutta*; *C. B. Clarke* n. 6961, *h. Calcutta*); Bengalia orientalis (*Griffith* n. 6154, *h. Kew*, n. 6195 *hh. Kew, Calcutta*); Bhotan, alt. 1200 metr. (*Gamble* n. 9599, *h. Calcutta*); Bombay (*Burn, h. Mus. Brit.*); Carnatic (*G. Thomson, h. Calcutta*); Madras Peninsula (*Heyne in Wallich* n. 3334 A, *h. Calcutta*); montes Nilghiri (*G. Thomson* nn. 4, 20, *h. Kew*); Zeylania (*Col. Walker, h. Kew*; *Thwaites, C. P.* n. 797, *hh. Kew, Mus. Brit., Calcutta*).

Burma et Malay Peninsula: Arracan (*Kurz, h. Calcutta*); Pegu (*Kurz* nn. 648, 649, 2674, *h. Calcutta*); Irrawaddy flumen (*Wallich* n. 190 *h. propr., h. Calcutta*); Mergui (*Griffith* n. 181, *h. Kew* n. 6196, n. 6196 *h. Calcutta*); Tenasserim (*Helfer* n. 796, *h. Kew* n. 6208 / 1, n. 6208 / 1 *h. Calcutta*); Malacca (*Griffith, h. Kew* nn. 6152, 6208, n. 6152 *h. Calcutta*); ins. Nicobar (*Kurz* n. 25977 bis, *h. Kew*).

Malaya: Bangka (*Amand, h. Kew*); Singapore (*Kurz, h. Calcutta*; *Kunstler* n. 111, *h. Calcutta*); Java (*Zollinger* nn. 267, 457 partim, 458, *h. Kew*); Buitenzorg (*Kurz* n. 132, *h. Calcutta*; *Forbes* n. 952, *h. Calcutta*); Borneo (*Motley* n. 99, *h. Kew*).

Japonia: Nagasaki (*Oldham* n. 900, *h. Kew*).

China: Hongkong (*C. Wright* n. 562, *h. Kew*); Macao (*Vachell* n. 681, *h. Kew*).

Ins. Philippine (*Cuming* n. 535, *hh. Kew, Mus. Brit.*).
Australia: Brisbane flumen (*Bailey, h. Kew*).

Var. *β. obliqua*; spiculis paucifloris, interdum 5–6-floris, sæpe pallidioribus.—*Nees! in Wight Contrib.* p. 86 (sp.); *Kunth, Enum.* ii. p. 60; *Boeck. in Linnæa*, xxxv. p. 611.

C. quinqueflorus, *Hochst! in Pl. Hohenack.* n. 944; *Steud. Cyp.* p. 37.
C. pennatus, *Steud. in Zoll. Verz. Ind. Archip.* p. 62, *non Nees.*
Cyperus, *Wall.! List.* n. 3334, A partim, B partim, C partim, D partim.

Varietas in *C. pilosum* typicum sensim transeuns. Nux cum ½ parte glumæ vix æquilonga.

Nepaul (*Wallich, h. Calcutta*).
Kumaon (*Wallich* n. 3334 C, *h. Calcutta*).
Sikkim (*T. Anderson* n. 1342, *h. Calcutta*).
Bengal et Nepal (*Wallich* n. 3334, B, D, *h. Kew*).
Pegu (*Kurz* n. 649, *h. Calcutta*).
Java (*Zollinger* n. 457 partim, *h. Kew*).

Var. *γ. polyantha*; spiculis usque ad 20–26 mm. longis, 40–45-floris, angustioribus autem quam *C. pilosi* typici; glumis minoribus, fere æquilongis ac latis.

Bengalia: Mymensingh (*C. B. Clarke* n. 7763, *h. Kew*).

Var. *δ. babakensis*, Steud.! in Zoll. Verz. Ind. Archip. p. 62 (sp.); spiculis in spicas densissimas breviter cylindricas congestis.—*Miq. Fl. Ind. Bat.* iii. p. 257; *Boeck. in Linnæa*, xxxv. p. 251.

C. Babakan, *Steud. Cyp.* p. 6.
Java (*Zollinger* n. 693, *h. Kew*).

117. C. BENGHALENSIS; umbella simplice; spiculis dense fasciculatim spicatis, rhachi glabra; glumis ovatis, obtusis, navicularibus, in carina sursum hispido-scabris; nuce obovoidea, triquetra, brevissime rostrata, cum ⅓ parte glumæ vix æquilonga.

Radix fibrosa. Culmus solitarius, 5 dm. longus, deorsum compressus, sursum triqueter levis. Folia 3–4, cum culmo fere æquilonga, lata 5–8 mm., acute carinata, in marginibus scabra. Involucri bracteæ 3–4, usque ad 3–4 dm. longæ, divaricatæ. Umbellæ radii 4–5, usque ad 4–6 cm. longi, trigoni. Spicæ subebracteatæ, longæ 25 mm., latæ 2 cm., 20–30-spiculosæ; rhachis vix scabra. Spiculæ undique dense patulæ, longæ 12 mm., latæ 3 mm., compressæ, 12–18-floræ; rhachillæ alæ angustæ, scariosæ, rubro-maculatæ, persistentes; gluma ima sæpe caudata. Glumæ spissæ, fuscæ, in dorso arcte 11-nerviæ, margine hyalino nullo aut angustissimo. Stamina 3; filamenta angusta, levia; antheræ lineari-oblongæ, muticæ, rubro-notatæ. Stylus nuce brevior; rami 3 longi, rubro-maculati. Nux nigra; cellulæ extimæ quadratæ; emarcidæ, albidæ, persistentes, conspicue reticulatæ.

[I believe this is the same plant as Buchanan-Hamilton's in Wallich h. n. 3336 E, collected at Nathpur in North Bengal; but at Kew I did not separate this species from *C. babakensis*.]

Bengalia (*Griffith, h. Kew* n. 6207); Mudhopoor (*C. B. Clarke* n. 7773, *h. Kew*; n. 7773, 7787, *h. Calcutta*).

118. C. LATIFOLIUS (*Poir. Encyc.* vii. p. 268); foliis bracteisque longis, latis; umbella composita, umbellulis corymbosim dense multispicatis; spiculis pallidis; glumis rotundis.—*Kunth, Enum.* ii. p. 75; *Boeck. in Linnæa*, xxxv. p. 602.

Mauritius (*Prescott, h. Calcutta*).

119. C. PROCERUS (*Rottb. Descr. et Ic.* p. 29, t. 5. fig. 3); robusta, foliata; umbella specie simplice, radiis apice corymbosim 3–5-spicatis; spiculis admodum remotis, majusculis; glumis late ellipticis, obtusis, ecarinatis; nuce cum ½ parte glumæ æquilonga, obovoidea, triquetra.—*Roth, Catalecta Bot.* p. 5; *Roxb. Fl. Ind.* i. p. 203 partim (*nec Roxb. Ic. ined.* t. 724); *Kunth, Enum.* ii. p. 72; *Nees! in Wight Contrib.* p. 83; *Thwaites, Enum. Pl. Zeyl.* p. 343.

C. torosus, *Rottb. Descr. et Ic.* p. 40, t. 11. fig. 3; *Vahl, Enum.* ii. p. 339.
C. ornatus, *R. Br.! Prod.* p. 217; *Kunth, Enum.* ii. p. 112; *Benth. Fl. Austral.* vii. p. 276.
C. carnosus, *Heyne*; *Nees! in Wight Contrib.* p. 83.
C. Heynei, *Boeck. in Linnæa*, xxxv. p. 600.
C. spadiceus, *Heyne! non Lam.* (*fide Rottler in h. propr.*).
Cyperus, *Wall.! List* n. 3355 A.
—, *Rheede, Hort. Mal.* xii. t. 50.

Radix fibrosa, non lignescens; stolones elongati, tenuiores, herbacei, e basi culmi erumpentes. Culmus solitarius, 5–8 dm. longus, apice triqueter. Folia 3–5, cum culmo sæpe fere æquilonga, complicata, valida, in margine fere levia. Involucri bracteæ 3–5, usque ad 2–4 dm. longæ, divaricatæ. Umbellæ radii 3–7, usque ad 4–15 cm. longi, apice subebracteati, 1–8-spicati; ochreæ 1–2 cm. longæ; umbellarum radioli 1-spicati, interdum longiusculi, basi ochreati, apice ebracteolati. Spicæ 2–8 cm. longæ, 15–30-spiculosæ; rhachis angulosa, flexuosa, glabra vel in angulis minute pilosa. Spiculæ inter se admodum remotæ, maturæ divaricatim patulæ, basi nudæ aut raro a seta conspicua suffultæ, longæ 2 cm., latæ 4 mm., compressæ, subturgidæ, 30–46-floræ; rhachilla subexalata. Glumæ adpresso-imbricatæ, marginibus involutis, cinnamomeo-rubescentes vel pallidiores, in dorso plano-concavo concoloriter 9–11-nerviæ; latera latiuscule estriata; margines hyalini, crispato-undulati, specie (exsiccati) serratuli. Stamina 3, subinclusa; antheræ oblongæ, truncatæ, obsolete cristatæ, rubescentes. Stylus cum $\frac{1}{3}$ parte nucis æquilongus; rami 3, longiusculi, rubro-maculati, exserti. Nux obtusiuscula, nigra; cellulæ extimæ quadratæ, emarcidæ, tenues, inconspicuæ.—In exemplis *C. proceri*, ante explicationem florum, spiculæ videntur subteretes; hæc sunt *C. torosus* lectorum veterum.—In *C. ornato*, R. Br., glumæ intensius castaneo-rubræ.—*C. procerus* (in herbariis veterum) cum *C. puncticulato* maxime confusus est.

Asia australi-orientalis cum Australia; in æstuariis maritimis etiamque in montanis.

India, alt. 0–1000 metr., ab Himalaya usque ad Zeylaniam (*Wallich* nn. 3355 B, 1203, *h. Mus. Brit.*); Chumba (*C. B. Clarke* n. 23683, *h. Kew*); Cooch Behar (*C. B. Clarke* n. 23683, *h. Kew*); Chota Nagpore (*C. B. Clarke* n. 25079, *h. Kew*); Madras Peninsula (*Heyne, h. Kew*; *Koenig, h. Kew*; *G. Thomson, h. Calcutta*; *Wight* nn. 1832, 2309, *h. Kew*); Zeylania (*Col. Walker, h. Kew*; *Thwaites C. P.* n. 3752, *hh. Kew, Mus. Brit., Calcutta*); Soonderbun, communis (*C. B. Clarke* n. 25079 &c.).

Arracan; in æstuariis submersis (*Kurz, h. Calcutta*).

Java (*Labillardière, h. Kew*).

China: Amoy (*Hance* n. 1392, *h. Kew*); Shanghai (*Maingay* n. 639, *h. Kew*).

Australia (*R. Brown* n. 5897, *hh. Kew, Mus. Brit.*); Queensland (*Amalia Dietrich* n. 609, *h. Mus. Brit.*).

[There is a fragment in h. Calcutta, collected in Maunbhoom (Chota Nagpore) by V. Ball, which may be a species closely allied to *C. procerus*; the spikelets are large, comose from the long stigmas, the rhachis of spike fuscous-pilose.]

Sect. N. *Corymbosi.*

Corymbosi, *Kunth, Enum.* ii. p. 53; *Boeck. in Linnæa*, xxxvi. p. 271.

Radix (in speciebus gerontogeis typicis) perennis, rhizomate repente, stolonibus sæpe additis; in speciebus americanis (hoc loco dubie locatis) annua aut fibrosa. Culmi trigoni vel teretes. Folia evoluta, aut in paucis abbreviata vel subnulla. Umbella sæpius laxa aut aperta, radiis longis aut conspicuis; spiculæ in pluribus numerosæ, spicatæ (in paucis americanis globoso-fasciculatæ), compressæ, multifloræ, sæpius acutæ. Rhachillæ alæ sæpius conspicuæ, persistentes aut solubiles. Glumæ naviculares sæpius muticæ, rarius breviter mucronatæ. Stamina 3. Styli rami 3, sæpius elongati. Nux sæpius ellipsoidea, trigona, cum $\frac{1}{3}$–$\frac{2}{3}$ parte glumæ æquilonga, nec minima nec maxima.

This group here contains all the species of *Eucyperus* which I have not been able to get into the preceding sections. The Old-World species form a tolerably natural group, except *C. stoloniferus* and *C. macer*, which perhaps should each have a section to itself. The American species, though some of them brought here by all authors, appear to me to differ considerably; *C. sphacelatus* with its annual root and narrowly-winged rhachilla is very near *C. compressus*. I have brought here *C. strigosus* and *C. congestus*, two common species placed by Boeckeler in a section called Fasciculati, which from its character differs from the Corymbosi in "spiculæ sæpissime disco impositæ;" but neither *C. strigosus* nor *C. congestus* is said (in its own description) to have such discs.

I hold that two very different things are included as discs by Boeckeler. In many species of *Cyperus* where the spikelet is at all oblique in its axis, in the dried state the rhachilla contracts very near the base *below* the lowest glume: here it seems to sit on a small cushion, but it is very firmly attached, and does not disarticulate at this point. This appearance (often only a result of drying) is not uncommon throughout the genus, as in *C. polystachyus*, where it is often prominent; and I estimate it as of no classificatory importance.

But in a number of species of *Cyperus* (*Mariscus* for me) above the two lowest barren glumes, the rhachilla of the spikelet disarticulates by a clean cut, leaving a small disc or cushion within the two barren glumes: this character may, I think, be made of the greatest use in a natural classification of the species.

I have divided this large section into three "series" for convenience; but the series pass into one another at various points.

Series * *Folia culmo breviora, sæpe abbreviata vel subnulla.*

120. C. ARTICULATUS (*Linn. Sp. Pl.* p. 66); subaphyllus; culmo terete, apice vix trigono, in sicco nodoso; umbella composita; spiculis breviter spicatis, pallidis vel subferrugineis; glumis ellipticis, arctius imbricatis; nuce late oblonga, cum $\frac{1}{2}$ parte glumæ æquilonga.—*H. B. K. Nov. Gen. et Sp.* i. p. 202; *Torrey in Ann. Lyceum New York*, iii. p. 256; *Kunth, Enum.* ii. p. 53; *Nees in Wight Contrib.* p. 80, *in Mart. Brasil. Cyp.* p. 35; *Griseb. Fl. Brit. West Ind.* p. 564; *Baker, Fl. Maurit.* p. 412; *Boeck. in Linnæa*, xxxvi. p. 274; *Benth. Fl. Austral.* vii. p. 278; *Boiss. Fl. Orient.* v. p. 374.

C. niloticus, *Forsk. Fl. Æg.-Arab.* p. 13; *Beauv. Fl. d'Owar.* ii. p. 63, t. 97. fig. 2; *Vahl, Enum.* ii. p. 302.

C. nudus, *Roxb. Fl. Ind.* i. p. 187 (*neque homonymus, Roxb. Fl. Ind.* i. p. 209), *neque H. B. K.*

C. gymnos, *Roem. et Sch. Syst. Mant.* ii. p. 97.

Cyperus, *Wall.* ! *List* n. 3364.

—, *Sloane, Jamaica*, i. p. 121, t. 81. fig. 1.

Stolones crassi, a squamis ovato-lanceolatis laxis atro-fuscis intecti. Culmi usque ad 1–2 metr., basi crassi, vivi leves nec nodosi, in sicco nodosi neque articulati. Vaginæ 3–4, culmum usque ad 2–3 dm. integentes, rarius breviter foliigeræ. Involucri bracteæ longæ 1–5 cm., lanceolatæ, basi erectæ, raro usque ad 1 dm. elongatæ, in marginibus fere leves. Umbellæ radii 4–12, usque ad 8–12 cm. longi; ochreæ 1 cm. truncatæ; umbellulæ congestæ, subcorymbosæ; spicæ numerosæ, ebracteatæ, breves, multispiculosæ. Spiculæ fasciculatim confluentes, longæ 1–4 cm., latæ 2 mm., 12–50-floræ; rhachillæ alæ oblongæ, solubiles, rubræ aut albo-hyalinæ; gluma ima brevis. Glumæ concavæ, non carinatæ, in dorso obscurius 3–5-nerviæ, viridescentes, in lateribus rubræ aut pallidæ. Stamina 3, inclusa; antheræ lineari-oblongæ, muticæ. Stylus $\frac{1}{2}$ parte nucis brevior; rami 3, breviter exserti. Nux utrinque angustata, trigona, nigra; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, inconspicuæ, persistentes.

In regionibus calidioribus orbis fere totius.

Asia: India Orientalis, Calcutta (*Roxburgh, h. Kew*); Bengal (*Griffith, h. Kew* n. 6214); Soonderbun, vulgaris (*C. B. Clarke*); Noakhali (*C. B. Clarke* n. 8204); Madras Peninsula (*Wight* n. 1823, *hh. Kew, Mus. Brit.*); Zeylania (*Thwaites C. P.* n. 3561, *hh. Kew, Mus. Brit., Calcutta*;

Ward n. 74, *h. Mus. Brit.*); Bangkok (*Koenig*, *h. Mus. Brit.*).

Australia: Portus Essington (*Armstrong* n. 568, *h. Kew*).

Madagascaria (*Gerrard*, *h. Kew*); Mauritius (*h. Calcutta*); ins. Seychelles (*Horne* nn. 237, 637, *h. Kew*); ins. Bourbon (*Balfour*, *h. Kew*).

Africa australis (*Drège*, *h. Kew*); Zambesia; Shire flumen (*Kirk*, *h. Kew*); Zanzibar (*Hildebrandt* n. 1058, *h. Mus. Brit.*).

Arabia (*Ehrenberg*, *h. Kew*); Oriens (*Forskael*, *h. Mus. Brit.*); Egypt, Ramleh (*Parquet* n. 44, *h. Mus. Brit.*); Damietta (*Sieber*, *h. Mus. Brit.*).

Nilus Albus (*Petherick*, *h. Kew*); Terra Monbuttu (*Schweinfurth* n. 3446, *h. Kew*).

Africa occidentalis (*Mann* n. 894, *h. Kew*); Angola (*Monteiro*, *h. Kew*); Congo (*Christian Smith* nn. 14, 26, *h. Mus. Brit.*); Senegambia (*Brunner*, *h. Kew*); Senegal (*Sieber* n. 101, *h. Mus. Brit.*).

Madeira (*Lowe*, *h. Mus. Brit.*).

America: Florida (*Curtiss* n. 3024, *h. Kew*; *Rugel* n. 156, *h. Mus. Brit.*); New Orleans (*Drummond* n. 383, *hh. Kew, Mus. Brit.*); Texas (*Berlandier* n. 3222, *h. Kew*); Mexico (*F. Mueller* n. 2151, *h. Kew*); Nicaragua (*Tate* n. 87, *hh. Kew, Mus. Brit.*).

Jamaica (*Purdie*, *h. Kew*).

Martinique (*Hahn* n. 1258, *h. Kew*).

America equatoria: Guiana, Cayenne (*Rothery*, *h. Mus. Brit.*); Columbia (*Karsten*, *h. Mus. Brit.*); New Granada, La Paila (*Holton* n. 119, *hh. Kew, Calcutta*); Venezuela (*Funcke* n. 599, *h. Mus. Brit.*; *Sagot* n. 644, *h. Mus. Brit.*); Surinam (*Hostmann* n. 432, *hh. Kew, Mus. Brit.*); Para (*Spruce* n. 87, *h. Kew*); Pernambuco (*Gardner* n. 1210, *hh. Kew, Mus. Brit.*); Amazon superior (*Traill* n. 1163, *h. Kew*); Bahia (*Blanchet* nn. 576, 2929, *h. Kew*).

121. C. NODOSUS (*Willd. Enum. Hort. Berol.* i. p. 72); culmo terete apice trigono, in sicco nodoso; foliis 1–2, culmo multum brevioribus; involucri bracteis umbella brevioribus; spiculis breviter spicatis, vix divaricatis, castaneo-brunneis, paullo compressis; glumis ellipticis in dorso viridi-nerviis; nuce cum ½ parte glumæ æquilonga, trigona.—*Kunth, Enum.* ii. p. 54; *Boeck. in Linnæa*, xxxvi. p. 275.

C. articulatus, *Benth. Pl. Hartw.* p. 124.

Stolones tenuiores. Culmi 5 dm. longi, tenuiores. Folia 18 cm. longa.

Peruvia borealis (*Spruce* n. 6413, *h. Mus. Brit.*).

Guayaquil (*Hartweg* n. 702, *h. Mus. Brit.*).

122. C. TEGETIFORMIS (*Roxb. Hort. Beng.* p. 6, *Ic. ined.* t. 1321 *in h. Kew*); subaphyllus; culmo trigono, apice ipso sæpe triquetro; involucri bracteis brevissimis, rarius cum ½ parte umbellæ compositæ æquilongis; spiculis spicatis, subteretibus, subulatis, pallidis, floris tempore rectangulatim patentibus; styli ramis e gluma floris tempore arctius imbricata longius exsertis.—*Arnott in Wight Contrib.* p. 19 *in nota*; *Kunth, Enum.* ii. p. 56.

C. nudus, ***Roxb. Fl. Ind.*** **i. p. 209** ***neque homonymus, Roxb. Fl. Ind.*** **i. p. 187.**

C. bengalensis, ***Spreng. Neue Entdeck.*** **iii. p. 101.**

C. Gula-Metthi, ***Roem. et Sch. Syst. Mant.*** **ii. p. 125.**

C. enodis, ***Boeck. in Linnæa,*** **xxxvi. p. 271.**

Cyperus, ***Wall.*** **!** ***List*** **n. 3351, A n. 2, B, C partim, H nn. 1, 2.**

Stolones crassi, longiusculi, teretes; squamæ 3–4 cm., ovato-acutæ, nigro-cinereæ. Culmi 6–16 dm., in sicco sæpe obscurius transversim nodosi, trigoni, basi bulboso-incrassati, apice in tabula Roxburghii n. 1321 triquetri, in exemplo autem Roxburghii (in Wall. List 3351 A n. 2 conservato) fere teres, in exemplis numerosis vivis visis triquetri aut saltem trigoni. Folia subnulla aut usque ad 2–8 cm. elongata; vaginæ plures, usque ad 15 cm. culmum integentes. Involucri bracteæ 2–3, 2–5 cm. longæ, lanceolatæ, rigidæ, erectæ, basi auriculatæ, in marginibus scabræ, rarius paullo elongatæ sed in exemplis ab umbella contracta coronatis cum umbella fere æquilongæ. Umbella 3–35 cm. in diam., composita aut decomposita; radii usque ad 15, usque ad 13 cm. longæ, tenuiores; ochreæ usque ad 15 mm. longæ, acumine lanceolato. Umbellulæ corymbosæ; radioli usque ad 8, usque ad 6 cm. longi, conspicue ochreolati, aut umbellulæ sæpius congestæ. Spicæ 4–16-spiculosæ. Spiculæ 1–3 cm. longæ, 10–30-floræ, floris tempore divaricato-patulæ, vix compressæ; rhachillæ alæ oblongæ, solubiles. Glumæ paullo remotæ, longæ 2 mm., ellipticæ, obtusæ aut emarginatæ, concavæ non carinatæ, in dorso 5–9-nerviæ, pallidæ fusco- vel rubro-notatæ. Stamina 3, subinclusa; antheræ lineares, muticæ, rubræ. Stylus nuce brevior; rami 3, longi. Nux cum ½ parte glumæ æquilonga, oblonga, trigona, sub-plano-convexa, nigra; cellulæ extimæ quadratæ, emarcidæ, persistentes, inconspicuæ.—Species a *C. corymboso* vix satis diversa.

Bengalia; China; Japan.

Bengalia (*Roxburgh, h. Kew*; *Griffith, h. Kew* n. 6204); Calcutta (*Kurz, h. Calcutta*; *T. Thomson, h. Calcutta*); Chittagong (*Hooker f. et T. Thomson* n. 401, *h. Kew*); Noakhali (*J. D. Hooker* n. 12, *h. Kew*; *C. B. Clarke* nn. 8194, 8203, *hh. Kew, Calcutta*); Burisal (*C. B. Clarke* n. 20036, *h. Kew*); Mymensingho (*C. B. Clarke* n. 17308, *hh. Kew, Calcutta*); Pundua (*J. D. Hooker* n. 356, *h. Kew*).

Assam (*Griffith n.* 1460, *h. Mus. Brit.*; *Jenkins, h. Calcutta*).

China: Whampoa (*Hance* nn. 1392, 6193, *h. Kew*).

Japan (*Bissett, h. Kew*).

123. C. CORYMBOSUS (*Rottb. Descr. et Ic.* p. 42, t. 7. fig. 4); subaphyllus aut breviter foliatus; culmo subtrigono, apice ipso terete aut obscurius trigono; involucri bracteis brevibus aut umbella decomposita sublongioribus; spiculis spicatis, paullo compressis, subferrugineis aut rubescentibus, florigeris fastigiatim suberectis; glumis florigeris imbricatis, styli ramis modice exsertis.—*Boeck. in Linnæa*, xxxvi. p. 277 partim, *nec Kunth.*

C. diphyllus, *Retz.*! *Obs.* v. p. 11; *Kunth, Enum.* ii. p. 54; *Boeck. in Linnæa*, xxxvi. p. 272; *Benth. Fl. Austral.* vii. p. 279 partim; *Boiss. Fl. Orient.* v. p. 374.

C. Koenigii, *Vahl, Enum.* ii. p. 302; *Kunth, Enum.* ii. p. 54.

C. monophyllus, *Vahl, Enum.* ii. p. 352.

C. seminudus, *Roxb.*! *Fl. Ind.* i. p. 187; *Nees in Wight Contrib.* p. 80; *Kunth, Enum.* ii. p. 55.

Papyrus Pangorei, *Nees*! *in Wight Contrib.* p. 88 partim.

Cyperus, *Wall.*! *List n.* 3351, C, E partim, F, G, H n. 3.

A *C. tegetiformi* vix differt spiculis paullo latioribus (in eadem spica quoad longitudinem sæpe conspicue variabilibus), florigeris erecto-confluentibus (nec divaricato-patulis), culmo apice non triquetro, bracteis brevibus sed sæpius cum $\frac{1}{2}$–$\frac{3}{4}$ parte umbellæ æquilongis (ut in Wall. List n. 3351, G, H n. 3, &c., videndæ sunt). In exemplo typico *C. diphylli*, Retz., in h. Mus. Brit. conservato, folia 2 usque ad 14 cm. longa, bracteæ umbellam plane superant.—*C. tegetum*, Roxb., omnino differt glumis magis distantibus, fructigeris vix imbricatis.

India Orientalis: Assam (*Griffith* n. 1459, *h. Mus. Brit.*; *Masters, Simons, h. Calcutta*); Kumaon (*Wallich* n. 3351 E, *h. Calcutta*); Khasia (*Hooker f. et T. Thomson, h. Calcutta*); Sylhet (*Wallich* n. 3351 F, *h. Calcutta*); Bengal (*C. B. Clarke* nn. 8523, 17951); Madras Peninsula (*Rottler, h. Kew*; *Koenig, h. Mus. Brit.*; *Wight in Wallich* n. 3351 C, *h. Calcutta*); Zeylania (*Thwaites C. P.* n. 809, *hh. Kew, Mus. Brit., Calcutta*).

Arracan (*Kurz* n. 667, *h. Calcutta*).

Pegu (*Kurz* nn. 668, 669, 2683, *h. Calcutta*).

Australia borealis: Portus Essington (*Armstrong, h. Kew*).

Var. β. *Pangorei*, Rottb. Descr. et Ic. p. 31, t. 7. fig. 3 (sp.); spiculis usque ad 3 cm. longis, 18–36-floris.—*Kunth, Enum.* ii. p. 57, *nec Roxb.*, *nec* Papyrus Pangorei, *Nees.*

C. corymbosus, forma macrostachya, *Boeck. in Linnæa*, xxxvi. p. 277.

Madras Peninsula (*Wallich* n. 3351 C, *h. Kew*); Tinnevelly (*Bidie, h. Kew*, tegetum materies *fide Bidie*).

Ins. Nossibé prope Madagascar (*Boivin, h. Kew*).

124. C. SCARIOSUS (*R. Br.*! *Prod.* p. 216); culmo pertenui; foliis 2–3, ⅓ parte culmi brevioribus; involucri bracteis 3, cum umbella composita contracta vix æquilongis; spiculis fere *C. tegetiformis* sed suberectis.—*Kunth, Enum.* ii. p. 112.

C. pertenuis, *Roxb. Fl. Ind.* i. p. 198, *Ic. ined.* t. 1320 *in hh. Kew, Calcutta*; *Nees in Wight Contrib.* p. 83; *Kunth, Enum.* ii. p. 99.

Stolones graciliores. Culmi solitarii aut approximati 5–7 dm., inter omnes vicinos tenuissimi, apice trigoni vix triquetri. Folia 3, summum ad 6–12 cm. longa. Involucri bracteæ 3, usque ad 6 cm. longæ, tenuiores. Umbella composita aut subsimplex, 5–8 cm. in diam., radii usque ad 7, graciles; umbella 30–50-spiculosa. Spicæ 3–7-spiculosæ. Spiculæ longæ 1 cm., latæ 1 mm., teretes, pallide fusco-roseæ; rhachillæ alæ latæ, hyalinæ, solubiles. Glumæ arcte imbricatæ, subacutæ, apice sæpe eroso-denticulatæ. —Inflorescentia fere *C. corymbosi*; spiculæ autem quam *C. tegetiformis* tenuiores; culmi tenues ab utraque specie distant. Species dubie bona (an *C. tenuiflori*, Rottb., forma depauperata?), pluribus aliis simillima, cum nulla alia omnino congruens.

Bengal: Calcutta (*fide Roxburgh*); Jessore (*C. B. Clarke* n. 8465, *hh. Kew, Calcutta*).

Pegu (*Kurz* nn. 683, 684, *h. Calcutta*).

Australia: in ora boreali (*R. Br.* nn. 5893, 5894, *h. Mus. Brit.*, n. 5993 partim *h. Kew*, n. 5994 partim *h. Kew*); in ora orientali (*R. Brown* n. 5895, *h. Mus. Brit.*).

125. C. **MACER**; culmis cæspitosis, gracilibus; foliis brevibus, angustis; umbella tenui, laxa, subcomposita; spiculis 2–4nis, digitatis, multifloris; glumis ovatis, obtusis.

Rhizoma brevissime repens, gracile, radicibus filiformibus nigris. Culmi numerosi, angustissimi, longi 5–8 dm., trigoni. Folia pauca, vix vagina longiora, cum $\frac{1}{3}$ parte culmi æquilonga. Involucri bracteæ 2–3, angustæ, umbellæ breviores, 2–4 cm. longæ. Umbellæ simplices vel parce compositæ, 5–8 cm. in diam.; radii tenues; umbellulæ laxe corymbosæ pauci-spiculosæ; umbellularum bracteolæ inconspicuæ. Spiculæ 8–16-floræ, compressæ; rhachillæ alæ angustæ, non solubiles. Glumæ remotiusculæ, in dorso 5–7-nerviæ, virides, in lateribus pallide brunneæ, enerviæ. Stamina 3; antheræ lineari-oblongæ, muticæ. Stylus longus, glumam superans, trifidus. Nux cum $\frac{2}{3}$ parte glumæ æquilonga, obovato-oblonga, obtuse trigona, nigra; cellulæ extimæ quadratæ, proventu albidæ, deciduæ.—Exempla Kurzii copiosa, optima. Spiculæ iis *C. tegetum* similes; habitus autem cum nuce speciem cum *C. Helferi* (inter Elegantes) conjungunt.

Pegu: in ripis fluminis Khaboung (*Kurz* n. 671, *h. Calcutta*).

Chittagong: in saxis fluminis Kornophullee (*C. B. Clarke* n. 19779, *hh. Kew*, *Calcutta*).

126. C. **TEGETUM** (*Roxb.*! *Fl. Ind.* i. p. 208); robustior; foliis culmo multo brevioribus aut subnullis; involucri bracteis 3–5, umbellam sæpe multo superantibus; umbella composita aut sæpius decomposita; spiculis breviter spicatis, florigeris erecto-patulis, multifloris, compressis; rhachillæ alis angustis, proventu solubilibus; glumis ellipticis, in exemplis exsiccatis jam ante florum expansionem distantibus, marginibus arcte incurvis; nuce oblonga, trigona, cum $\frac{1}{2}$ parte glumæ æquilonga.

C. corymbosus, *Koenig in h. propr. partim*; *Kunth, Enum.* ii. p. 55; *Strachey, Cat. Kumaon Pl.* p. 74; *Boeck. in Linnæa,* xxxvi. p. 277 *pro majore parte*; *non Roxb.*

C. Schimperianus, *Steud.*! *Cyp.* p. 34; *Boeck. in Linnæa,* xxxvi. p. 277.

C. dehiscens, *Steud. Cyp.* p. 31.

C. longus, *Hochst. in Schimper* n. 57; *Oliver in Trans. Linn. Soc.* xxix. p. 165, *non Linn.*

C. Pangorei, *Thwaites, Enum. Pl. Zeyl.* p. 344, *non Rottb.*

C. elongatus, *Hochst. in Schimp.* n. 1994.

C. nudiculmis, *Sieber, MS. in h. propr.*

Papyrus dehiscens, *Nees ! in Wight Contrib.* p. 89.

C. Pangorei, *Nees ! in Wight* n. 1844, *h. propr., in Wight Contrib.* p. 88 *pro majore parte.*

C. corymbosus, *Nees in Wight Contrib.* p. 89 (*syn. Rottb. excl.*).

Cyperus, *Wall. ! List* n. 3332 A (= C. tegetum, *h. Roxb.* !).

Cyperus, *Wall. ! List* n. 3329, I partim.

Cyperus, *Wall. ! List* n. 3352, A, B, C (cum *C. malaccensi* mixta), D.

Cyperus, *Wall. ! List* n. 3330, *exemplum alterum.*

Tegetum materies, a Doctore G. King sub nomine *C. tegetum* a Calcutta communicata. — Rhizoma lignosum, breviter repens. Culmi solitarii aut approximati, 5–8 dm. longi, trigoni. Folia in exemplo Roxburghii 3, summum usque ad 14 cm. longum; vaginæ sæpius nudæ, a folio 2–8 cm. longo rarius terminatæ. Involucri bracteæ sæpe 3 dm. longæ, erecto-patentes proventu patulæ, in marginibus serrulato-scabræ, umbellam fere semper conspicue superantes. Umbella 1–3 dm. in diam.; radii 4–12, usque ad 8–16 cm. longi; ochreæ 15 mm. longæ, laxiusculæ. Umbellularum radioli 3–8, usque ad 4–9 cm. longi, sæpe iterum umbellulati. Spicæ longæ 5–10 mm., 4–10-spiculosæ; spiculæ longæ 2 cm., latæ 2–3 mm. (in exemplo Roxburghiano majores), 10–20-floræ, in dorso virides, in lateribus pallidæ aut (maturæ) sæpius brunneæ aut rubræ, in Africanis interdum castaneæ. Glumæ longæ 2–3 mm., obtusæ, fere truncatæ, vix carinatæ, 3–7-nerviæ. Stamina 3, subinclusa; antheræ lineari-oblongæ, muticæ vel obsolete cristatæ, fusco-sanguineæ. Stylus nuce multo brevior; rami 3, e gluma breviter exserti. Nux breviter angustata, nigro-brunnea; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, porosæ.

[This plant, abundant in India, is the authentic *C. tegetum*, Roxburgh; it differs decisively from *C. corymbosus* in the much more distant glumes, which in the dried specimens have the margins incurved not overlapping. The spikelets are more compressed than those of *C. corymbosus*. The colour in India varies from pale to a high red-brown: with the more highly coloured Indian examples many African are absolutely identical; but there are other African specimens chestnut or almost black. It is far more difficult to distinguish *C. tegetum* in Africa from *C. longus* and its various forms called *C. badius*; the only absolute distinction appears to lie in the much longer leaves of *C. longus*. The rhizome of *C. longus* differs a good deal from that of *C. tegetum*, as is evident enough when you have *the whole* of the rhizomes to compare, which may be once in a hundred specimens.

The narrow wing of the rhachilla is in *C. Schimperianus*, as in *C. longus*, less soluble than in the Indian *C. tegetum*, but I doubt the value of this character.]

India Orientalis, Abyssinia et Egypt.

India, ab Himalaya usque ad Zeylaniam, vulgaris: Almora, alt. 1200 metr. (*Strachey et Winterbottom* n. 9, *hh. Kew, Mus. Brit.*); Chumba, alt. 900 metr. (*C. B. Clarke* n. 23688, *h. Kew*); Kumaon (*Wallich* n. 3352 D, *h. Calcutta*); Nepaul (*Wallich, h. Kew* n. 1013, *h. Mus. Brit.*); Sikkim, alt. 200 metr. (*C. B. Clarke* n. 10127, *h. Calcutta*); Khasia colles (*Hooker f. et T. Thomson, h. Kew*); Soane flumen (*J. D. Hooker* n. 421, *h. Kew*); Bengal (*Wallich* nn. 3351, 3352 A, *h. Calcutta*); Chota Nagpore (*Wood* n. 161, *h. Calcutta*; *C. B. Clarke* n. 21184, *h. Calcutta*); alt. 600 metr. (*Kurz, h. Calcutta*); Sarunda (*Gamble* n. 9103, *h. Calcutta*); Carnatic v. Mysore (*G. Thomson, h. Calcutta*); Zeylania (*Thwaites C. P.* n. 813, *hh. Kew, Mus. Brit., Calcutta*).

Burma: Karen colles (*Kurz* n. 673, *h. Calcutta*).

[Mauritius: sub nomine "*Cyp. textili*" introduite de Pondicherry, *h. Kew.*]

Abyssinia (*Schimper* nn. 57, 854, 1994, *h. Kew*); Nilus superior (*Grant, h. Kew*).

Egypt: Elephanta (*Kralik, h. Kew*).

Var. *β. ambigua*; spiculis longis 45 mm.; rhachillæ alis angustis non solutis; glumis longis 4 mm. et ultra.

Cyperus, *Wall.*! *List* n. 3330, *exemplum alterum.*

Cyperus, *Wall.*! *List* n. 3329 F (*h. Kew, non h. Linn. Soc.*).

Madras Peninsula? (*Heyne in h. Wall. propr.*; *Wallich* n. 3330, *h. Calcutta*).

Var. ? *γ. protracta*; protracta; culmo tenui; folio summo cum culmo æquilongo; umbella subcapitata, paucispiculosa; spiculis longis 45 mm., 50-floris.

Culmus 3 dm. Folium angustissimum. Umbellæ radii 1–3, 0–3 cm. longi, tenues. Spicæ 4-spiculosæ laxæ.

Socotra (*Balfour, h. propr.*).

Series ** *Foliatæ, rhizomate* (nisi in *C. amauropus*) *perenni, spiculis spicatis*; omnes gerontogei quædam etiam in America repertæ.

127. C. GRACILINUX; umbella laxiuscula, simplice aut composita; spiculis laxiuscule spicatis, divaricatis, acutis, pallidis;

glumis subdistantibus; rhachillæ alis conspicuis, solubilibus; nuce angusta, cum $\frac{2}{3}$ parte glumæ æquilonga.

C. tenuiculmis, *Boeck. in Flora*, 1879, p. 554, *non Boeck. in Linnæa*, xxxvi. p. 286.

Stolones plures, graciliores, a vaginis numerosis laxis lanceolatis brunneis intectæ. Culmi solitarii, 5 dm. longi, mediocres vix tenues, trigoni, apice triquetri. Folia 2–5, cum $\frac{2}{3}$ parte culmi æquilonga, angustiora, in marginibus minute scabra. Involucri bracteæ 3–5, usque ad 2–3 dm. longæ. Umbellæ radii 4–8, usque ad 14 cm. longi; ochreæ longæ 2 cm., a folio setiformi sæpe terminatæ. Umbellulæ radioli 3–5, usque ad 4 cm. longi; bracteolæ sæpe 2–4 cm. longæ, setaceæ. Spicæ 1–2 cm. longæ, 5–12-spiculosæ; rhachis glabra; gluma ima sæpe setiformis. Spiculæ longæ 2 cm., latæ 3 mm., compressæ, 8–14-floræ. Glumæ ellipticæ, obtusæ, compressæ vix carinatæ, in dorso 5–7-nerviæ pallide virides, in lateribus luteo-stramineæ. Stamina 3, vix exserta; antheræ lineari-oblongæ, obtusæ, rubescentes. Stylus nuce multo brevior; rami 3, plane exserti. Nux lanceolata, paullo curvata, triquetra, contra rhachillam compressa, ibique concava.

Africa centralis: Djur (*Schweinfurth* nn. 2016, 2029, *h. Kew*).

128. C. LONGUS (*Linn. Sp. Pl.* p. 67); culmo elongato, foliato, basi decumbente, repente, crassiusculo nec bulboso; umbellæ radiis elongatis; spicis sæpius pedunculatis; spiculis breviter spicatis, paullum compressis; glumis imbricatis, florigeris non distantibus; nuce cum $\frac{1}{3}$ parte glumæ æquilonga, ellipsoidea aut oblongo-obovoidea.—*Jacq. Ic. Pl. Rar.* ii. p. 8, t. 297; *Vahl, Enum.* ii. p. 346; *Host, Gram.* iii. p. 51, t. 76; *Engl. Bot.* t. 1309; *Kunth, Enum.* ii. p. 60; *Reich. Ic. Fl. Germ.* t. 282. fig. 672; *Sturm, Fl. Deutsch.* xiii. t. 52; *Koch, Syn. Fl. Germ.* p. 850; *Bert. Fl. Ital.* i. p. 269; *Gren. et Godr. Fl. Franç.* iii. p. 358; *Parl. Fl. Ital.* ii. p. 12; *Cosson, Expl. Algér. Glum.* p. 248; *Boeck. in Linnæa*, xxxvi. p. 279 (var. ϵ, ζ, η excl.); *Boiss. Fl. Orient.* v. p. 375.

C. depauperatus, *Steud. Cyp.* p. 34, e descr.
C. Heldreichianus, *Boiss, Diagn.* i. fasc. 13, p. 39.
— Cyperus, *Griff. Itin. Notes*, p. 277, n. 697.
— Cyperus, *Griff. Itin. Notes*, p. 280, n. 747.

Culmus ima basi non bulboso-incrassatus, curvatus, horizontalis, interdum repens, crassiusculus, 3–7 dm. longus, apice acute triqueter, robustior. Folia 2–4, cum ½–¾ parte culmi æquilonga, robustiora, in marginibus serrulato-scabra. Involucri bracteæ 3–5, usque ad 2–6 dm. longæ, umbellam longe superantes. Umbellæ radii 3–10, erecto-patuli, usque ad 3–12 cm. longi; ochreæ longæ 1–3 cm., apice a seta unica sæpe terminatæ. Umbellulæ iterum umbellatæ vel ad unicam spiculam reductæ; radioli ultimi (in forma typica) elongati, basi ochreolati, apice unicam spicam proferentes. Spica 5–15 mm. longa, 5–15-spiculosa; rhachis glabra. Spiculæ erecto-patulæ, rarius divaricatæ, ferrugineo-rubescentes, rarius atro-castaneæ, longæ 15 mm., latæ 2 mm., 10–18-floræ; rhachillæ alæ conspicuæ, vix solubiles. Glumæ spissæ, compressæ vix carinatæ, ovatæ, obtusæ, in dorso virides 4–7-nerviæ, in lateribus coloratæ vix striatæ. Stamina 3, subinclusa; antheræ lineari-oblongæ, muticæ aut submucronatæ. Stylus nuce brevior; rami 3, breviter exserti. Nux subobtusa, apiculata, trigona, nigra; cellulæ extimæ quadratæ, emarcidæ, hyalinæ, porosæ.

Regio Mediterranea; ab Anglia usque ad Cabul.

Anglia: Somersetshire (*Thwaites, h. Kew*; *Scott, h. Calcutta*; *Dyer, h. Calcutta*); Wilts, Boyton (*Henslow, h. Calcutta*).

France: Indre et Loire (*Vercier* n. 224, *h. Kew*); ins. Jersey (*Stevens, h. Kew*; *Haslar, h. Calcutta*).

Africa: Algiers (*Bové* n. 316, *h. Kew*); Khartoum (*Schweinfurth* n. 616, *h. Kew*).

Ins. Rhodes (*Bourgeau* n. 150, *h. Kew*).

Syria borealis (*Kotschy* n. 74, *h. Kew*; *Lowne, h. Calcutta*).

Byzantium (*Postian* n. 654, *h. Kew*).

Armenia Rossica (*Besser, h. Kew*); Kurdistan (*Kotschy* nn. 292, 393, *h. Kew*); Tauria (*Compin, h. Calcutta*).

Aberbeidschan (*Fischer, h. Calcutta*).

Cabul (*Griffith* nn. 29, 30, *h. Kew* n. 6145; *Griffith* nn. 6145 6180, *h. Calcutta*); Quetta (*Hamilton, h. Calcutta*).

India: mons Aboo (*G. King, h. Calcutta*).

Var. β. *pallescens*, Boiss. Fl. Orient. v. p. 375; spicis laxis; spiculis distantibus, paullo majoribus, pallidis, fere stramineis.—*Desf. Fl. Atlant.* i. p. 45, t. 9; *Willk. et Lange, Fl. Hisp.* i. p. 139.

C. Lamarckianus?, *Hochst.*! *in Kotschy* n. 222.

C. ochreoides, *Steud. Cyp.* p. 34.

C. longus, var. pallida (*saltem pro parte*), *Boeck. in Linnæa*, xxxvi. p. 280.

C. mitis, *Steud. Cyp.* p. 315, *fide Boeck.*

In exemplis authenticis visis radix deest; hæc var. forsan sub *C. rotundo* melius militabit.—*C. mitis* a Griffith in Bengalia lectus est, species mihi omnino dubia.

Egypt: prope Canalem Alexandriæ (*Letourneux* n. 152, *h. Kew*).

Cordofan (*Kotschy* n. 222, *h. Kew*).

Hispania: Bœtica et prope Malaga, fide *Willk. et Lange.*

Var. γ. *cyprica*; spiculis acutis, lucide rubris.

C. rotundus, *Sintems et Rigo, MS. in h., non Linn.*

Rhizoma repens, crassiusculum. Culmi distantes, longi 1–5 dm., tenues. Umbella simplex; radii 2–4 cm. longi. Spiculæ in unoquoque radio 3–5, subfasciculatæ.—Planta mihi difficilis; e rhizomate cum *C. rotundo* neutiquam jungenda.

Ins. Cyprus (*Kotschy* n. 771, *h. Kew*; *Sintems et Rigo* n. 872, *a*, *b*, *h. Kew*).

Var. δ. *badia*, Desf. Fl. Atlant. i. p. 45, t. 7. fig. 2 (sp.); spicis ultimis sæpe approximatis, subfasciculatis; spiculis patulis aut divaricatis, sæpe fuscis aut atro-castaneis.—*Reichb. Ic. Fl. Germ.* t. 283. fig. 673; *Vahl, Enum.* ii. p. 346; *Parl. Fl. Ital.* ii. p. 38; *Gren. et Godr. Fl. Franç.* iii. p. 358; *Koch, Syn. Fl. Germ.* p. 849; *Willk. et Lange, Fl. Hisp.* i. p. 139; *Boiss. Fl. Orient.* v. p. 376.

C. brachystachyus, *Presl! Gram. et Cyp. Sicul.* p. 15, *non Steud.*

C. thermalis, *Dumort. Fl. Belg.* p. 145.

C. denudatus, *Heyne in Wall. List* n. 3349.

C. myriostachyus, *Tenore, Fl. Nap.* iii. p. 47; *Bert. Fl. Ital.* i. p. 271; *Parl. Fl. Ital.* ii. p. 41.

C. amœnus, *Drège, litt. e (nec c, d).*

In *C. myriostachyo*, inflorescentia fere *C. badii*, spicularum color *C. longi* videtur.

Ab Europa australi usque ad Caput Bonæ Spei.

Portugal (*Welwitsch* n. 341, *h. Kew*).

Hispania (*Bourgeau* n. 509, *h. Kew*); Navarre (*Willkomm* n. 220, *h. Kew*).

Toulon (*Bourgeau* n. 407, *h. Kew*).

Palermo (*Todaro* n. 899, *h. Calcutta*).

Attica (*Heldreich* n. 2548, *h. Kew*).

Algiers (*Munby, h. Kew*); Tangier (*Sulzmann, h. Calcutta*); Marocco (*J. D. Hooker, h. Kew*; *Rein. et Fritsch* n. 394, *h. Kew*).

Ins. Madeira (*Findlay, h. Kew*; *Lowe* n. 392, *h. Kew*).

Ins. Teneriffe (*Findlay* n. 15, *h. Kew*).

Ins. Azores (*Godman, h. Kew*; *H. C. Watson* n. 262, *h. Kew*).

Caput Bonæ Spei (*Drège* litt. e, *h. Kew*; *Bolus* nn. 3926, 5813, *h. Kew*); Vaal flumen (*Nelson* n. 86, *h. Kew*; *Burchell* n. 385, *h. Kew*).

[India Orientalis: Madras? (*Wight in Wallich h. propr.* n. 3349); an indigena?]

Var. ε. *elongata*, Sieber; spiculis minus compressis; glumis laxiuscule imbricatis, sæpe aureo-brunneis aut rufis.

C. tenuiflorus, *Jacq. Ic. Pl. Rar.* ii. p. 8, t. 296; *Presl, Gram. et Cyp. Sicul.* p. 15; *Ten. Fl. Nap.* iii. p. 47; *Guss. Fl. Sicul. Suppl.* i. p. 780; *Webb et Berth. Iles Canar. Phyt.* iii. p. 364; *Boeck. in Linnæa,* xxxvi. p. 281, *non Rottb.*

C. Preslii, *Parl. Fl. Ital.* ii. p. 40.

C. intermedius, *Guss. Fl. Sicul. Suppl.* i. p. 780, *non Steud.*

C. amœnus, *Kunth, Enum.* ii. p. 58, *non Roxb.*

C. emarginatus, *Schrad. Anal. Fl. Cap. Cyp.* p. 5; *Kunth, Enum.* ii. p. 60.

C. lateriflorus, *Steud. in Flora,* 1829, p. 152.

In *C. amœno*, Kunth, stolones lignosi, tenuiores; culmi plures fasciculati; spiculæ pallidiores.

Egypt inferior (*Kotschy* n. 945, *h. Kew*; *Schweinfurth* n. 2029, *h. Kew*); Tentyra (*Sieber, hh. Kew, Calcutta*).

Sennaar (*Kotschy* n. 171, *h. Kew*).

Africa australis (*Drège, h. Kew*; *Burchell* nn. 1937, 2651, *h. Kew*).

[As regards many of the specimens without rhizome, as Sieber's Tentyra plant with black-chestnut glumes, Schweinfurth's n. 2029 with short leaves, they perhaps would be better placed under *C. tegetum*.

Var. ε. *adoensis*, Boeck. in Linnæa, xxxvi. p. 282=Schimper h. Abyss. n. 186, looks a distinct species.

Var. ζ. *maculatus*, Boeck. in Linnæa, xxxvi. p. 282, as to Barter n. 1213, from Nupe, also looks distinct.

Var. η. *gracilis*, Boeck. in Linnæa, xxxvi. p. 282, is Wall. List n. 3329 F; this in Wallich h. propr. is *C. rotundus*, but the Calcutta specimen of that number is *C. tegetum*, var. *ambigua*.

From Boeckeler's description I guess his plant to have been *C. tegetum*, Roxb., *fere typ.*]

129. C. ROTUNDUS (*Linn. Sp. Pl.* p. 67, *non Linn. h. propr.*); culmo foliato, basi bulboso-incrassato; stolonibus tenuibus, lignosis, sæpe tuberiferis; umbella simplice aut composita; spiculis breviter spicatis, suberectis, multifloris, compressis, nunquam lutescentibus; glumis florigeris arctius imbricatis, ovatis, obtusis, per $\frac{1}{2}$–$\frac{2}{3}$ latitudinem nervosis; stylorum ramis longius exsertis; nuce cum $\frac{1}{3}$–$\frac{2}{3}$ parte glumæ æquilonga, late ellipsoidea, acuta aut subobtusa, triquetra.—*R. Br. Prod.* p. 216; *Roxb. Fl. Ind.* i. p. 197; *Nees, Pl. Medic. Abbild.* t. 25. fig. A; *Presl, Rel. Hænk.* i. p. 175; *DC. et Lam. Fl. Franç.* iii. p. 146; *Kunth, Enum.* ii. p. 58; *Webb et Berth. Iles Canar. Phyt.* iii. p. 363; *Parl. Fl. Ital.* ii. p. 36; *Hassk. Pl. Jav. Rar.* p. 80; *Benth. Fl. Hongk.* p. 387, *Fl. Austral.* vii. p. 279; *Griseb. Fl. Brit. West Ind.* p. 564; *Boeck. in Linnæa,* xxxvi. p. 283; *Baker, Fl. Maurit.* p. 410; *Cosson, Expl. Algér. Glum.* p. 247; *Boiss. Fl. Orient.* v. p. 377.

C. hexastachyus, *Rottb. Descr. et Ic.* p. 28, t. 14. fig. 2; *R. Br. Prod.* p. 216; *Nees in Wight Contrib.* p. 81; *Decaisne in Nouv. Ann. Mus. d'Hist. Nat.* iii. p. 358.

C. Hydra, *Mich. Fl. Amér. Bor.* i. p. 27; *Vahl, Enum.* ii. p. 344; *G. W. F. Meyer, Esseq.* p. 31; *Presl, Rel. Hænk.* i. p. 175; *Elliot, Bot. Carolina,* p. 68, t. 2. fig. 2; *Torrey in Ann. Lyceum New York,* iii. p. 265.

C. tetrastachyus, *Desf. Fl. Atlant.* i. p. 44, t. 8; *Vahl, Enum.* ii. p. 343.

C. bicolor, *Vahl, Enum.* ii. p. 340.

C. olivaris, *Targ.-Tozz. in Mem. Soc. Ital. Scienz.* xiii. pars 2, p. 338; *Bert. Fl. Ital.* i. p. 267; *Reichb. Ic. Fl. Germ.* t. 281. fig. 671; *Gren. et Godr. Fl. Franç.* iii. p. 359; *Willk. et Lange, Fl. Hisp.* i. p. 138.

C. officinalis, *Nees, Pl. Medic. Abbild.* t. 25. fig. B.

C. radicosus, *Sibth. Fl. Græc.* i. p. 32, t. 45; *Griseb. Spic. Fl. Rumel.* p. 421.

C. comosus, *Sibth. Fl. Græc.* i. p. 31, t. 44; *Benth. Pl. Hartw.* p. 157; *non Kunth.*

C. leptostachyus, *Griff. Itin. Notes,* p. 321, *non Nees.*

C. esculentus, *Gouan, Fl. Monsp.* p. 389, *non Linn.*

C. maritimus, *Bojer, Hort. Maurit.* p. 378, *non Poir.*

C. stoloniferus, var. pallida, *Boeck.* ! *in Linnæa,* xxxv. p. 490, *non Retz.*

C. proteinolepis, *Boeck.* ! *in Flora,* 1879, p. 549, *non Steud.*

C. longus, *Boeck.* ! *in Aitch. Kuram Pl.* n. 684, *in Journ. Linn. Soc.* xviii. p. 104, *non Linn.*

— Cyperus, *Linn. Fl. Zeyl.* p. 15, n. 15.
— Cyperus, *Wall.*! *List* n. 3317, A partim.
— Cyperus, *Wall.*! *List* n. 3322, A, B, C, D, E.
— Cyperus, *Wall.*! *List* n. 3329, B partim, C, D, E, F, G, H, I.
— Cyperus, *Wall.*! *List* n. 3332, C.
— Cyperus, *Wall.*! *List* n. 3353, A, B.
— Cyperus, *Griff. Itin. Notes*, p. 276, n. 689 (*Kew* n. 6179).
— Cyperus, *Griff. Itin. Notes*, p. 10, n. 142 (*Kew* n. 6193).
— Cyperacea, *Griff. Itin. Notes*, p. 277, n. 702 (*Kew* n. 6144).
— Cyperacea, *Griff. Itin. Notes*, p. 319, n. 1225 (*Kew* n. 6180).
— Cyperacea, *Griff. Itin. Notes*, p. 321, n. 1253 (*Kew* n. 6180).
— Agrostotheca, *Sieber* n. 109 (*sed non* C. littoralis, *R. Br.*).
— *Rumph. Herb. Amb.* vi. t. 1. fig. 1, 2.

Rhizoma repens, lentum, tubera 1–3 cm. longa, ovoidea aut oblonga, sæpe proferens. Culmi solitarii (aut approximati vix fasciculati) 1–6 dm. longi, trigoni, apice triquetri, basi incrassati aut bulbosi. Folia 3–5 aut plura, validiora, cum $\frac{2}{3}$ parte culmi sæpius æquilonga, in marginibus scabrida. Involucri bracteæ 3–5, patulæ, umbellam sæpius multo superantes, interdum abbreviatæ. Umbella simplex aut composita, radiis sæpius pluribus, elongatis, modo autem congesta aut depauperata, modo effusior magna; ochreæ 1 cm. longæ, subtruncatæ. Spicæ 5–20 mm. longæ, ebracteatæ, 3–20-spiculosæ; rhachis glabra. Spiculæ floriferæ sæpius erecto-patulæ, longæ 3 cm., latæ 3 mm. (vel multo minores majoresve), 32-floræ (vel 8–70 floræ), rubro-virides, pallide virides, intensius sanguineæ aut castaneæ, nunquam (ut in *C. esculento* aliisque vicinis) aureo-virides aut luteæ; rhachillæ alæ hyalinæ, rarius sanguineo-maculatæ, interdum solubiles. Glumæ fructigeræ imbricatæ, laxiores, vix turgidæ, ovatæ, obtusæ, compressæ vix carinatæ, in lateribus (quam in *C. esculento*) latiuscule enerviæ, estriatæ. Stamina 3; antheræ exsertæ, lineari-oblongæ, rubescentes aut pallidæ, muticæ. Stylus cum nuce fere æquilongus vel multo brevior; rami 3, longi, sæpe sanguineo-maculati. Nux quoad magnitudinem variabilis, utrinque angustata, latiuscula, subæqualiter acute trigona, nigro-fusca; cellulæ extimæ quadratæ, emarcidæ, tenuiter hyalinæ, porosæ, aut albidæ, opacæ; ideoque nux obscurius (raro lucide) reticulatim albo-velata.—Species inter omnes *Cyperos* vulgatissima, in tropicis utriusque orbis pestis. Varietates infra enumeratæ melius pro formis meris habendæ. Species plures *C. rotundo* similes, ab auctoribus optimis difficillime discretæ, caute cognoscendæ sunt, nempe:—

C. stoloniferus, nuce inæqualiter trigona, spiculis teretioribus.

C. longus, culmo basi non bulboso, rhizomate quasi culmi prolongatione, nuce minore.

C. esculentis, glumis per $\frac{2}{3}$–$\frac{3}{4}$ partem latitudinis striatis, viridi-luteis, aureis aut aureo-brunneis.

C. tenuiflorus, Rottb., umbella late composita, spiculis divaricatis, nuce trigona neque acute triquetra.

C. jeminicus, culmi basi bulbosa nigro-squamata, umbellæ radio imo subdistante.

C. gracilinux, nuce anguste lineari-oblonga.

C. pertenuis, culmo tenui, foliis cum $\frac{1}{3}$ parte culmi æquilongis.

C. tegetum, glumis florigeris (in sicco) vix imbricatis.

C. corymbosus, foliis sæpius brevibus, culmo basi non bulboso.

Per regiones calidiores totius orbis terrarum vulgaris; quam in oryzetis aliisque cultus tam in graminosis pestis.

EUROPA.—Portugal (*Broteiro* n. 401 [C. bulbillosus], *h. Kew*; *Welwitsch* n. 339 [C. badius], *h. Kew*; Lisbon (*Daveau* [C. esculentus], *h. Calcutta*).

Hispania (*Bourgeau* n. 1539, *h. Kew*; *Willkomm* n. 875 [C. longus], *h. Kew*); Barcelona (*Bentham, h. Calcutta*); Gibraltar (*Salzmann* [C. humilis], *h. Kew*).

Corsica (*Mabille* n. 284 [C. olivaris], *h. Kew*).

Candia (*Sieber* [C. comosus], *hh. Kew, Calcutta*).

Athens (*Orphanides* n. 259 [C. radicosus], *h. Kew*; *Heldreich* n. 2547 [C. comosus], *h. Kew*).

AFRICA.—Algiers (*Munby* [C. tetrastachys], *h. Kew*).

Egypt (*Sieber* n. 55 [C. elongatus], *h. Kew*; *Schweinfurth* n. 2023, *h. Kew*); Lacus Mareoticus (*Aucher-Eloy, h. Calcutta*).

Nubia (*Kotschy* n. 358, *h. Kew*; *Kotschy* n. 28 [C. elongatus], *h. Kew*).

Libyian Desert (*Ascherson* n. 542 [C. esculentus], *h. Kew*).

Ethiopia (*Kotschy* n. 170, *h. Kew*).

Niger flumen (*Barter* n. 853, *h. Kew*; *Vogel* n. 62 [C. pallescens], *h. Mus. Brit.*).

Madeira: Funchal (*h. Calcutta*).

Ins. S. Helena (*Burchell* n. 11 [C. tuberosus], *h. Kew*).

Gallabat (*Schweinfurth* n. 2026 [C. longus, var. elongata, *Boeck.*], *h. Kew*).

Djur (*Schweinfurth* n. 1822, *h. Kew*).

Berber (*Schweinfurth* nn. 188, 405, 470, 500, 525, 530, 754, *h. Kew*).

Nilus Albus (*Schweinfurth* n. 945, *h. Kew*).

Cordofan (*Pfund* n. 628 [C. longus], *h. Kew*).

Abyssinia (*Schimper* nn. 370, 546, 1291, 1379, 1556, *h. Kew*, =var. spadicea, *Boeck. in Linnæa*, xxxvi. p. 284).

Comoro (*Bojer* [C. platystachys], *h. Kew*; *Hildebrandt* n. 1736, *h. Kew*).

Zambesi flumen (*Kirk*, *h. Kew*).

Caput Bonæ Spei: Albert District (*Cooper* n. 1365, *h. Kew*).

Natal (*Buchanan* n. 312, *h. Kew*).

Ins. Mascarene: Madagascar (*Hildebrandt* nn. 3320, 3355, *h. Kew*); Bourbon (*Balfour*, *h. Kew*); Mauritius (*Sieber* n. 6, *h. Kew*); Seychelles (*Bouton* n. 23, *h. Kew*).

ASIA.—Syria (*Lowne*, *h. Calcutta*).

Iberia et Tauria (*Wilhelms*, *h. Calcutta*).

Bagdad (*Reichenbach f.* [C. Tenorii], *h. Kew*).

Cabul (*Griffith* n. 6179, *h. Calcutta*).

India: Gilgit (*Winterbottom* n. 928, *h. Kew*); Kashmir (*Jacquemont* n. 663, *h. Kew*); Simla (*Jacquemont* n. 2372, *h. Kew*); Sutledge flumen (*Jacquemont* n. 1102, *h. Kew*); India boreali-occidentalis (*Royle* [C. tenuiflorus], *h. Kew*); Gurwhal (*G. King*, *h. Calcutta*); Lahore (*Brandis* n. 2615, *h. Calcutta*); Kuram convallis (*Aitchison* n. 684 [C. longus], *h. Calcutta*); mons Aboo et India centralis (*G. King*, *h. Calcutta*); Khasia colles (*Griffith* n. 142, *h. Calcutta*); Bengalia (*Griffith* n. 6193, *h. Calcutta*); Poona (*Jacquemont* nn. 340, 382, *h. Kew*); Madras Peninsula (*Wight* nn. 1826, 1827 [C. hexastachyus], *h. Kew*; *Wallich* n. 3316, *h. Calcutta*).

Peninsula Malayana: Pegu (*Kurz* n. 682, *h. Calcutta*); Mergui (*Griffith*, *h. Kew*, n. 6194); Moulmein (*Parish* n. 264, *h. Calcutta*); ins. Andaman (*Kurz*, *h. Calcutta*); Tenasserim (*Helfer* n. 6194, *h. Calcutta*); ins. Penang (*Stoliczka*, *h. Calcutta*).

Malaya: Singapore (*Kurz* n. 3007, *h. Calcutta*; *Kunstler* n. 112, *h. Calcutta*); Java (*T. Anderson* n. 373, *h. Calcutta*; *Zollinger* n. 282, *h. Kew*); Buitenzorg (*Kurz* n. 197, *h. Calcutta*); Banca (*Teysmann* [C. bulbuso-incrassatus], *h. Kew*); Borneo (*Barber* n. 323, *h. Calcutta*); Labuan (*Motley* n. 323, *h. Kew*).

China (*Sir G. Staunton* [C. odoratus, *Osbeck non Linn.*], *h. Kew*): Hongkong (*C. Wright* n. 560, *h. Kew*); Canton

(*Hance* n. 1247, *h. Kew*); Shanghai (*Maingay* nn. 640, 763, *h. Calcutta*); ins. Formosa (*Oldham* n. 583, *h. Kew*; *Swinhoe*, *h. Calcutta*).

Japonia (*h. Calcutta*).

Ins. Loochoo (*Beechey*, *h. Kew*).

Ins. Samoa (*Biker* n. 1227, *h. Kew*).

Ins. Philippine (*Cuming* nn. 715, 557, *h. Kew*).

AUSTRALIA.—Australia (*R. Brown* n. 5891, *h. Kew*).

Australia tropicalis (*Bidwill* n. 137 partim, *h. Kew*).

Queensland (*F. Mueller*, *h. Kew*).

AMERICA.—Florida (*Curtiss* n. 3055, *h. Kew*).

Texas (*Elihu Hall* n. 684, *h. Kew*).

Ins. Martinique (*Sieber* n. 14, *h. Kew*; *Hahn* n. 888, *h. Kew*).

Ins. New Providence (*Brace* n. 397, *h. Kew*).

Guiana: Cayenne (*Sagot* n. 1361, *h. Kew*).

Bahia (*Salzmann* [C. sphacelatus], *h. Kew*; *Glocker* n. 216 [C. helodes], *h. Kew*).

Rio Janeiro (*Glaziou* nn. 523, 11654, *h. Kew*).

Brazil (*Martius* n. 860 [C. hexastachyus], *h. Kew*).

Respublica Argentina: Cordoba (*Hieronymus* n. 740, *h. Kew*).

Var. α. *Salsola*; culmis 1–2 dm. longis; foliis cum $\frac{1}{3}$–$\frac{1}{2}$ parte culmi æquilongis; umbella simplice pauciradiata; spicis sæpe 3–4-spiculosis (imo culmis 1–4-spiculigeris); involucri bracteis umbella multo brevioribus, interdum 1–3 cm. longis.

India Orientalis, præsertim in maritimis; vulgaris.

Australia: forma frequens.

Neo-Zeelandia (*Kirk*, *h. Kew*).

Var. β. 100-*flora*; spiculis elongatis, sæpe curvatis vel tortis. — Cyperus, *Wall.*! *List* n. 3373.

Spiculæ, in *G. Thomson* n. 258, usque ad 9 cm. longæ, 118-floræ.

Africa tropicalis: frequens.

India Orientalis: Madras Peninsula (*G. Thomson* n. 258, *h. Kew*).

Australia tropicalis (*Bidwill* n. 137 partim, *h. Kew*).

Var. γ. *Amaliæ*; rhizomate squamato; foliis sæpe brevibus; umbella simplice contracta, sublaterali; involucri bracteis breviusculis, umbellam superantibus; spiculis sublucide brunneo-rubris.

Australia: Queensland, Rockhampton (*Amalia Dietrich* n. 712, *h. Kew*); Victoria, Murray et Darling flumina (*F. Mueller, h. Kew*); Portus Molle (*Macgillivray, h. Kew*).

Var. δ. *procerula*; culmo elongato robustiore; umbella explanata, modo subsimplice modo composita; spiculis laxe spicatis, majusculis, acutis, sub-lineari-lanceolatis, rubescentibus aut pallidis nec lucidis; glumis laxiuscule (fructigeris vix) imbricatis; nuce maxima, lata, acute triquetra.—*Nees! in Wight Contrib.* p. 82 (sp.); *Kunth, Enum.* ii. p. 51.

C. Retzii, *Nees! in Wight Contrib.* p. 82; *Kunth, Enum.* ii. p. 73; *Thwaites, Enum. Pl. Zeyl.* p. 343; *Roxb. Ic. ined.* t. 720, *in h. Kew.*
C. tuberosus, *Roxb. Fl. Ind.* i. p. 199; *Boeck. in Linnæa,* xxxvi. p. 285, *syn. Kunth et Rottb. excl.*
C. Pangorei, *Retz, Obs.* iv. p. 10, *nec Rottb. nec Roxb.*
C. viridis, *Roxb. Ic. ined.* t. 714, *in h. Kew.*
C. rotundus, var. acuta, *Boeck. in Linnæa,* xxxvi. p. 284.
— Cyperus, *Wall.! List* n. 3356 [= C. albidus, *Heyne*].

Cyperi proceruli, Nees, exemplum typicum (Wight n. 1829, h. propr.), a manu Neesii nomine inscriptum, nucibus maturis gaudens, mihi videtur omnino idem ac Wight n. 1830 h. propr., exemplum junius florigerum, a manu Neesii nomine *C. Retzii* inscriptum. Inter hæc et *C. rotundum* typicum exempla plurima sensim transeuntia videnda sunt.

In exemplo typico *C. procerulo*, nuces maturæ magnæ, triquetræ, ideoque auctores *C. procerulum* cum *C. compresso* infauste contulerant.

In *C. rotundo* typico ut in *C. Hydra* (Anglice "Nut-grass") rhizomata pestifere reptante, nux rarius maturat.

Madras Peninsula (*Wight* nn. 1829, 1830, *h. Kew*).

Zeylania (*Thwaites C. P.* n. 3750, *h. Kew*).

Var. ε. *laxata*; spiculis longis 18 mm. latis 3 mm., 10–14-floris, compressis, rubris; glumis majusculis, elongatis, sursum angustatis, subdistantibus, florigeris patulis laxe vel vix imbricatis; rhachillæ alis angustissimis, junioribus saltem non solubilibus.

Exemplum (nuce ignota) mihi sat dubium; an *C. glabro* affinior?—color autem spicularum distat.

Naples (*Heldreich* [C. olivaris], *h. Kew*).

130. C. STOLONIFERUS (*Retz, Obs.* iv. p. 10); rhizomate longe repente, lignoso; culmis basi bulbosis, apice trigonis; umbella simplice; spiculis breviter spicatis, subteretibus; glumis spissis,

ovatis, obtusis, pallidis, purpureo-notatis; stylo alte 3-fido, breviusculo; nuce obovoidea, trigona, a dorso compressa, nigro-castanea.—*Nees in Wight Contrib.* p. 81; *Boeck. in Linnæa*, xxxv. p. 489 (syn. *C. tuberoso* et var. β exclusis).

C. littoralis, *R. Br.! Prod.* p. 216.
C. spadiceus, *Lam. Ill.* i. p. 147, *fide Nees; non h. Koenig.*
C. bulboso-stoloniferus, *Steud.! in Zoll. Verz. Ind. Archip.* p. 62.
C. tuberosus, *Baker, Fl. Maurit.* p. 410, *nec Rottb.*
C. rotundus, *Koenig in h. propr.*; *Benth. Fl. Austral.* vii. p. 279 partim, *non Linn.*
C. arenarius, *Hance in h. propr., nec Retz.*
C. lamprocarpus, *Boeck. in Linnæa*, xxxv. p. 490.
— Cyperus, *Wall.! List* n. 3315.
— Cyperus, *Wall.! List* n. 3309 partim (*Fimbristylidis* specie admixta).

Stolones elongati, validi. Culmi distantes, 1–2 dm. longi. Folia cum culmo æquilonga aut breviora, sursum minute dentata, in sicco plana vel complicata. Involucri bracteæ sæpius 3, quarum una, junior suberecta, usque ad 5–8 cm. longa, aut brevior. Umbellæ radii 1–4, longi 1–4 cm. Spiculæ longæ 15 mm., latæ 2–3 mm., parum compressæ, sæpius suberectæ interdum curvatæ, in unoquoque radio 3–8, ebracteatæ, parum distantes, 12–22-floræ; rhachillæ alæ angustæ, hyalinæ, persistentes; gluma ima parva, obtusa. Glumæ dense imbricatæ, concavæ nec carinatæ, obscurius 5–9-nerviæ, leves. Stamina 3; filamenta levia; antheræ lineares, muticæ, sanguineo-notatæ. Stylus brevissimus; rami 3, plane exserti, crassiusculi, sanguineo-notati. Nux cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, obtusa, in facie interiore plana subconcava, in dorso convexa tenuiter angulata, nigra; cellulæ extimæ quadratæ, emarcidæ, lucide albidæ, reticulatæ, plus minus detergibiles.—Nux matura non minus quam in *C. lamprocarpo*, nitida.—*Cyp. stoloniferus* β. *pallida*, Boeck., in exemplo nimis juveni stabilita (=*C. complanatus*, Presl; Steud. Cyp. p. 3) mihi videtur (e spiculis compressis) *C. rotundus*.—Boeck. (in Linnæa, xxxv. p. 490) scripsit "stylo elongato (quandoque abbreviato) profunde bi- vel tri-fido, aut indiviso." In exemplis sat numerosis a me visis, stylus videtur 3-fidus; stylum indivisum aut bifidum nunquam vidi.

Asia australi-orientalis, cum Malaya, Mauritio et Australia septentrionali in maritimis, frequens.

Ins. Mascarene (*Macgregor, h. Mus. Brit.*); Mauritius (*Sieber* nn. 11, 28, *h. Kew*, n. 11 *h. Mus. Brit.*; *Ayres, h. Kew*).

India Orientalis: Goojerat (*h. Mus. Brit.*); Zeylania (*Koenig, h. Mus. Brit.*); Bombay (*Jacquemont* n. 430, *h. Kew*); Madras Peninsula (*Wight* n. 1825, *h. Kew*, n. 2861 *h. Calcutta*); Tranquebar (*Klein, h. Kew*); Nilghiri montes (*Foulkes, h. Kew*); Carnatic (*G. Thomson, h. Calcutta*).

Ins. Penang (*G. King, h. Calcutta*).

Singapore vel Borneo (*Burbidge, h. Kew*).

Singapore (*Kurz* n. 2991, *h. Calcutta*).

Ins. Nicobar (*h. Mus. Brit.*).

Sumatra (*Heyne, h. Mus. Brit.*; *Cuming* n. 2437, *hh. Kew, Mus. Brit.*).

Java (*Zollinger* n. 1321, *h. Mus. Brit.*; *Horsfield, h. Mus. Brit.*).

China: Amoy et Macao (*Hance* n. 1386, *h. Kew*).

Australia: in ora septentrionali (*R. Brown* n. 5892, *h. Kew*).

131. C. TENUIFLORUS (*Rottb. Desc. et Ic.* p. 30, t. 14. fig. 1, *non Jacq.*); stolonifer; culmis elongatis, foliaceis, basi incrassatis; umbella composita, tenui, laxa; spiculis angustis, florigeris sæpe rectangulatim patulis; glumis subremotis, imbricatis.—*Vahl, Enum.* ii. p. 347; *Roxb. Fl. Ind.* i. p. 199, *Ic. ined.* t. 1109 in h. Kew; *Dalz. and Gibs. Bomb. Fl.* p. 284; *Nees in Wight Contrib.* p. 82 partim; *Kunth, Enum.* ii. p. 57 partim; (*non* C. longus var. tenuiflora, *Boeck. in Linnæa*, xxxvi. p. 281).

C. torsus, *Vahl, Enum.* ii. p. 339.
C. Roestelii, *Kunth, Enum.* ii. p. 58.
C. pertenuis, *Bojer, Hort. Maurit.* p. 379, *non Roxb.*
C. longus, *Baker, Fl. Maurit.* p. 411, *non Linn.*
— Cyperus, *Wall.* ! *List* n. 3329, A, I partim.

Culmi basi lignosim bulbosi, 6–9 dm. longi, tenuiores, plane trigoni. Folia 2–4, usque ad 5 dm. longa, angusta. Involucri bracteæ 3–5, usque ad 3–4 dm. longæ, divaricatæ, angustæ. Umbella tenuiter composita; radii 3–7, usque ad 5 cm. longi, admodum tenues; ochreæ 1 cm. longæ, angustissimæ; umbellularum radioli elongati, tenues. Spicæ 10–15 mm. longæ, 6–10-spiculosæ, laxæ. Spiculæ longæ 12 mm., latæ 2–3 mm., ferrugineæ aut pallidæ, fere ut *C. rotundi* sed tenuiores.—Species fortasse in *C. rotundum* var. *procerulam* transeuns, a *C. longo* remota.

Mauritius (*Horne, h. Kew*; *Bouton, h. Kew*; *&c.*).

Socotra (*Schweinfurth* n. 691, *h. Balfour*).

Zeylania (*Thwaites C. P.* n. 3966, *h. Kew*).

Bengal (*Griffith, h. Kew*, n. 6141) ; Calcutta (*Kurz, h. Calcutta* ; *C. B. Clarke* n. 8515, *h. Kew*).

Madras (*Dr. Shuter, h. Kew*).

Forma *australica* ; umbella composita aut decomposita, ramulis patule corymbosis ; spiculis pallidis aut læte brunneis ; nuce parva, anguste obovoidea, obtusissime trigona.

C. rotundus *partim, Benth. Fl. Austral.* vii. p. 279.

Culmus basi bulboso-incrassatus ; rhizoma lignosum, tenue. Nux cinereo-fusca, matura nitide albo-reticulata, quam *C. rotundi* multo minor, minus acute triquetra.

[This plant appears well separable from *C. rotundus* by the much smaller obtuser nut, and it seems to match well with the Indian *C. tenuiflorus* ; but the nut of the latter I have never found (it is probably rare as in *C. rotundus*), and this casts a shadowy doubt over the whole business.]

Australia : in regione interiore (*McDougal, h. Kew*) ; in ora australi-occidentali (*Cunningham, h. Kew*, n. 345 *h. Mus. Brit.*) ; Arnheim's Land (*F. Mueller, h. Kew*) ; in ora boreali-orientali (*Bidwill, h. Kew*) ; interiore boreali-occidentali (*Mitchell, h. Kew*).

132. C. JEMINICUS (*Rottb. Descr. et Ic.* p. 25, t. 8. fig. 1) ; culmo basi bulboso, a squamis crassis nigris ovatis acutis detergibilibus intecto ; umbellæ contractæ, radio imo subdistante 1-bracteato ; glumis ovatis, subacutis, rubescentibus aut sanguineis, per totam fere latitudinem nervosis.—*Willd. Sp. Pl.* i. p. 281 ; *Roxb. Fl. Ind.* i. p. 191.

C. bulbosus, *Vahl, Enum.* ii. p. 342 ; *Nees in Wight, Contrib.* p. 80 ; *Dalz. and Gibs. Bomb. Fl.* p. 284 ; *A. Rich. Fl. Abyss.* ii. p. 483 ; *Boeck. in Linnæa*, xxxvi. p. 300 ; *Bois. Fl. Orient.* v. p. 377.

C. laxus, *R. Br. in Salt Abyss. Append.* p. 62, *nomen nudum.*

C. bulbiferus, *Dietr. Sp. Pl.* ii. p. 324.

C. oleraceus, *Roxb. Ic. ined.* t. 733, *in h. Kew.*

C. geminatus, *hh. Koenig et Rottler, non Schrader.*

C. rotundus, *Kunth, Enum.* ii. p. 58 partim, auctorumque aliorum, *non Linn.*

C. rotundus β pendulus, *Nees in Wight, Contrib.* p. 12 pro minore parte (habitat plurimis exclusis).

Hemichlæna bulbosa, *A. Rich. Fl. Abyss.* ii. p. 509.

— Cyperus, *Wall.* ! *List* n. 3317 A partim, B, C.

Culmi 8–24 cm. tenuiores, basi bulbosi ; stolones tenues, bulbillos tuberiformes remote proferentes. Squamæ nigræ longæ 1 cm. basin culmi normaliter integunt; his detersis, exempla ad *C. rotundum* sæpe relata sunt. Folia plura, sæpe plurima, culmum longe superantes vel hoc multo breviores, latiusculi vel interdum angusti. Umbella sæpius contracta pauciradiata, rarius 1 dm. in diam., laxior. Umbella fere semper imperfecta; rami inferiores inter se distantes, unibracteati; bracteæ 4–8 cm. longæ, apice setaceæ; etiamque e medio umbellæ 1–2 bracteæ setaceæ sæpe exstant. Umbellæ radii brevissimi, rarius 2–4 cm. longi, simplices, rarius divisi. Spicæ 3–12-spiculosæ, densæ vel laxiores; rhachis glabra. Spiculæ longæ 15 mm., latæ 3–4 mm., compressæ, 8–14-floræ; rhachillæ alæ solubiles. Glumæ compressæ, subdistantes, imbricatæ, in dorso anguste virides, in lateribus lucide rubræ aut castaneo-ferrugineæ, concoloriter multinerviæ. Stamina 3, breviter exserta; antheræ lineares, muticæ. Stylus brevis; rami 3, e gluma breviter exserti. Nux oblongo-obovoidea, cum $\frac{1}{3}$ parte glumæ subæquilonga.—Si squamæ nigræ culmi basin integentes desint, species a *C. rotundo* glumis per totam fere latitudinem striatis, umbella imperfecta, cognoscenda est; a *C. esculento* glumis rubescentibus nec lutescentibus distingui potest.

A Yemen usque ad peninsulam Madras et Senegambia.

Jedda (*Fischer* n. 54, *h. Kew*; *Schimper* n. 809, *h. Kew*).

Beloochisthan (*Frere, h. Kew*).

Scinde (*Stocks, h. Kew*; *Dalzell, h. Calcutta*).

Zeylania (*Trimen, h. Kew*).

Madras Peninsula (*Heyne in Wallich* n. 3317, *h. Calcutta*; *Wight* nn. 1824, 1828, *h. Kew*, n. 2868 *h. Calcutta*; *G. Thomson* n. 102, *h. Kew*, n. 58 partim *h. Calcutta*).

Abyssinia (*Schimper* n. 2238, *h. Kew*).

Africa centralis: Uganda (*Wilson* n. 751, *h. Kew*); Berber (*Schweinfurth* n. 406, *h. Kew*).

Flumen Senegal (*J. Gay, h. Kew*).

Caput Verde (*Bolle, h. Kew*).

133. C. USITATUS (*Burchell*; *Roem. et Sch. Syst.* ii., *Mant.* p. 477); bulbo squamato a basi culmi vix incrassati, ope rhizomatis tenuis lignosi paullo distante; umbella contracta, imperfecte umbellata; glumis ovatis, rubescentibus aut sanguineis, per totam fere latitudinem striatis.—*Nees in Linnæa*, x. p. 136; *Kunth, Enum.* ii. p. 107; *Boeck. in Linnæa*, xxxv. p. 511.

C. semitrifidus, *Schrad. Anal. Fl. Cap. Cyp.* p. 6; *Kunth, Enum.* ii. p. 107; *Boeck. in Linnæa*, xxxv. p. 513.
C. herbivagus, *Kunth, Enum.* ii. p. 53.
C. solidus, *Kunth, Enum.* ii. p. 76.

A *C. jeminico* vix nisi rhizomate distinguenda. In *C. usitato* bulbus a basi culmi 1–4 cm. distat. Quoad rhachillam spicularum discrimen mihi videtur nullum.—*C. vestitus*, Hochst. in Flora, 1845, p. 755; *Steud. Cyp.* p. 41, e descriptione ad *C. jeminicum* affinior est.

Africa australis (*Burchell* nn. 1999, 2082, 2684, *h. Kew*; *Zeyher* n. 1743, *h. Kew*).

Africa australi-orientalis (*Nelson* n. 97, *h. Kew*).

134. C. THOMSONI (*Boeck. in Linnæa*, xxxvi. p. 294); culmo robustiore, foliato; spiculis numerosis, spicatis, undique patentibus, majusculis, acutis, stramineo-brunneis; glumis laxe imbricatis, ellipticis, subacutis; nuce cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, angustius oblonga.

Cyperus sp. n. 55, *Herb. Ind. Or., Hook. f. et T. Thoms.*

Rhizoma breve, lignosum, nigrosquamatum, culmo 1, vel paucis approximatis. Culmus 3–6 dm. longus, basi incrassatus, trigonus, apice triqueter. Folia 3–5, longius vaginata, valida, culmum sæpe superantia, marginibus sursum scabris. Involucri bracteæ 3–4, usque ad 4 dm. longæ, patulæ. Umbella sæpius densa, interdum radiis longioribus 2 dm. in diam., in uno exemplo ad unicam spicam reducta; radii robusti, interdum ad 8 cm. longi, sæpius breves; ochreæ 10–15 mm. longæ, subinflatæ, apice lanceolatæ; umbellulæ corymbosæ; radioli sæpius brevissimi 1-spiculosi, interdum 1–2 cm. longi, plurispiculosi. Spicæ longæ 2–3 cm., 20–40-spiculosæ; rhachis glabra. Spiculæ longæ 22 mm., latæ 4–5 mm., modice compressæ, 16–24-floræ; rhachillæ alæ admodum angustæ, persistentes; gluma ima bracteiformis, longius setuligera. Glumæ vix carinatæ, in dorso arcte 9–11-nerviæ, in lateribus latis scariosæ, brunneo-maculatæ. Stamina 3; filamenta angusta; antheræ lineari-oblongæ, rubescentes, muticæ (apice sanguineæ obsolete cristatæ). Stylus nuce multo brevior; rami 3, e gluma breviter exserti. Nux trigona, apice subacuta, nigrescens; cellulæ extimæ quadratæ, emarcidæ, nitide hyalinæ (*i. e.* nux alboreticulata).

Bengalia: in paludibus Jheel dictis (*J. D. Hooker* n. 263, *h. Kew*); Cachar (*Keenan, h. Kew*); Sylhet (*C. B. Clarke*

n. 7235, *hh. Kew, Calcutta*); Siligori (*C. B. Clarke* n. 11688, *h. Kew*).

Assam (*Jenkins, Masters, h. Calcutta*); Seebsagur (*Kurz, h. Calcutta*).

135. C. ESCULENTUS (*Linn. Sp. Pl.* p. 67); culmo basi incrassato, foliato; stolonibus tenuibus, sæpe tuberiferis; umbella simplice aut composita; spiculis spicatis, patulis, viridi-lutescentibus aut brunnescentibus; glumis ovatis, obtusis, per latitudinem fere totam striatis.—*Vahl, Enum.* ii. p. 345; *Host, Gram.* iii. p. 50, t. 75; *Kunth, Enum.* ii. p. 61; *Bert. Fl. Ital.* i. p. 256; *Boeck. in Linnæa,* xxxvi. p. 287; *Coss. Expl. Algér. Glum.* iii. p. 246; *Boiss. Fl. Orient.* v. p. 377.

C. Sieberianus, *Link, Hort. Berol.* i. p. 313.

C. tuberosus, *Rottb. Descr. et Ic.* p. 28, t. . fig. 1; *Vahl, Enum.* ii. p. 340; *Pursh. Fl. Am. Sept.* i. p. 52; *Kunth* partim, *nec Boeck.*

C. damiettensis, *Dietr. Sp. Pl.* ii. p. 269.

C. melanorrhizus, *Delile*; *Parl. Fl. Ital.* ii. p. 33; *Moggr. Contrib. Fl. Mentone,* t. 97.

C. aureus, *Tenore, Fl. Nap.* iii. p. 45; *Reichb. Ic. Pl. Crit.* iii. p. 10, t. 212; *Gren. et Godr. Fl. Franc.* iii. p. 360, *non H. B. K.*

C. Tenorii, *Presl, Fl. Sicul.* p. xliii; *Bert. Fl. Ital.* i. p. 264; *Reichb. Ic. Fl. Germ.* t. 281. fig. 670.

C. Tenorianus, *Roem. et Sch. Syst.* ii., *Mant.* p. 544.

C. Hydra, *H. B. K. Nov. Gen. et Sp.* i. p. 205, *non Mich.*

C. rotundus, var. pallida, *Benth. Fl. Austral.* vii. p. 280.

C. rotundus, *Benth. Pl. Hartw.* p. 28.

C. gracilis, *Humb. et Bonpl.*; *Link, Jahrb.* iii. p. 84.

C. gracilescens, *Roem. et Sch. Syst.* ii., *Mant.* p. 100; *Nees in Mart. Brasil. Cyp.* p. 36.

C. nervosus, *Bert.*; *Roem. et Sch. Syst.* ii., *Mant.* p. 113.

C. retusus, *Nees in Linnæa,* ix. p. 285; *Kunth, Enum.* ii. p. 115, *non Hochst.*

C. phymatodes, *Muehl. Gram.* p. 23; *Link, Jahrb.* iii. p. 87; *Torrey, Fl. United States,* i. p. 62; *Kunth, Enum.* ii. p. 62; *Sereno Watson, Bot. California,* ii. p. 215.

C. repens, *Elliott, Bot. South Carolina,* i. p. 69; *Torrey in Ann. Lyceum New York,* iii. p. 264; *Chapman, Fl. South. States,* i. p. 508.

C. Hermanni, *Buckley in Proc. Philad. Acad.* 1862, p. 10.

— Cyperus sp. n. 32, *Herb. Ind. Or., Hook. f. et T. Thomson.*

— Cyperus, *Wall.*! *List* n. 3354, A.

Stolones flexuosi, 1–3 mm. crassi, a squamis longis 5–8 mm. ovatis acutis luteis aut brunneis ornati; tubera 1 cm. in diam., ovoidea, nigrescentia aut pallida, transversim zonata aut tomentosa vel sublevia. Culmi 1–5 dm. trigoni, sursum triquetri. Folia 2–5 aut sæpe plura, culmo longiora aut breviora, rigidiora, latiuscula, in margine scabra. Involucri bracteæ 3–5, usque ad 8–18 cm. longæ, umbellam sæpius plane superantes, patulæ. Umbella simplex aut composita, sæpius 5–12 cm. in diam., interdum (præsertim in Americanis) evoluta, haud raro contracta, in *C. Hermanni*, Buckley, fere capitata; radii 3–10, longi 1–8 cm.; ochreæ 5–15 mm. longæ; radii apice 1-spicati aut subcorymbosim paucispicati, a bractea angustissima sæpe suffulti. Spicæ 5–30 mm. longæ, laxe 4–14-spiculosæ; rhachis glabra. Spiculæ floriferæ rectangulatim patulæ, non congestæ, aureæ, brunneæ aut pallidæ, nec rubræ nec sanguineo-castaneæ, longæ 5–30 mm., latæ 2–4 mm., quoad formam magnitudinem florum numerum sat variabiles, compressæ aut subinflatæ; rhachillæ alæ solubiles. Glumæ remotiusculæ aut arctius stipatæ, florigeræ spissæ aut rarius causa marginum incurvorum vix imbricatæ, ovatæ, obtusæ, truncatæ aut obscurius apicatæ, compressæ vix carinatæ, in dorso virides 3–5-nerviæ, in lateribus lucidæ concoloriter plicato-striatæ. Stamina 3, subinclusa aut longe exserta; antheræ lineari-oblongæ, muticæ, lutescentes, rarissime rubræ. Stylus nuce brevior; rami 3, e gluma vix exserti vel longissime exserti (quoad longitudinem in diversis formis admodum diversæ). Nux cum $\frac{1}{3}$–$\frac{1}{2}$ parte glumæ æquilonga, latissime vel angustius oblonga, obtusa, obscurius apicata, subæqualiter trigona, nigra; cellulæ extimæ quadratæ, emarcidæ, albidæ, lucide porosæ (ideoque nux "albo-reticulata"). —Inter tot exempla, tot synonima, hæc mihi pro formis melius habenda:—

Forma *princeps*; umbella 3–10 cm. in diam., simplex aut parce composita; spiculæ longæ 15 mm., latæ 2 mm., 16-floræ, aureæ aut aureo-brunneæ; glumæ remotiusculæ, florigeræ plane imbricatæ; styli e gluma breviter exserti; nux oblonga.—Forma in Europa, Asia, Africa, America vulgaris; nec differt *C. phymatodes*, Muehl.

Forma *melanorrhiza*; umbella quam in forma *principe* paullo magis evoluta; spiculæ longæ 8–10 mm., latæ 3 mm., subinflatæ, 14-floræ, pallidæ aut brunnescentes; glumæ florigeræ laxe imbricatæ; styli e gluma longissime exserti; nux late oblonga.—In regione Mediterranea cum ins. Mascarensibus.

Forma *tuberosa* (sp. Rottb.); spiculæ lineari-oblongæ, compressæ, subtruncatæ, 8–12-floræ.—In Madras indigena; a forma *melanorrhiza* paullo recedens spiculis magis compressis, stylis parum exsertis. A Rottler cum *C. hyalino*, Vahl, cujus spiculæ similes, admixta.

Forma *hindustanica* (*Cyperus* sp. n. 32, Hook. f. et T. Thoms.); culmi fasciculati, umbella divaricatim composita; spiculæ longæ 1 cm., latæ 2–3 mm., 14-floræ, subinflatæ; glumæ in lateribus fere estriatæ, florigeræ vix imbricatæ; nux fere ut in forma *melanorrhiza*.—In India boreali-occidentali.

Forma *evoluta*; umbellæ radii 6–9 cm. longi, divaricati, apice corymbosi; spiculæ aureo-luteæ, usque ad 35 mm. longæ, 40-floræ; glumæ distantes, florigeræ non imbricatæ; styli rami e gluma breviter exserti.—A Florida usque ad Monte-Video (in formam principem sensim transeuns); etiamque in Africa australi.

Ab Europa australiore usque ad Indiam, Australiam, Africam australem; in omni America calidiore.

Europa: Mentone (*Moggridge, h. Kew*); Naples (*Tenore, h. Kew*); ins. Crete (*Sieber, h. Kew*).

India: Punjab, Chenab flumen (*T. Thomson, h. Kew*); Moradabad (*T. Thomson, h. Kew*); Delhi (*C. B. Clarke* n. 23361, *h. Kew*); Madras Peninsula (*G. Thomson* n. 69, *hh. Kew, Calcutta*); montes Nilghiri (*Hohenacker* n. 1294, *h. Kew*); Poona (*Jacquemont* n. 277, *h. Kew*).

Australia: Queensland (*Wuth, h. Kew*).

Madagascar (*Hilsenberg et Bojer, h. Mus. Brit.*); Mauritius (*Bojer* [C. maritimus], *h. Kew*).

Africa: Caput Bonæ Spei (*Buchanan* n. 212, *h. Kew*; *Wood* n. 1581, *h. Kew*; Natal (*Buchanan* nn. 83, 316, *h. Kew*; *Krauss* n. 97, *h. Kew*); Abyssinia (*Schimper* n. 1246, *h. Kew*); Djur (*Schweinfurth* n. 1731, *h. Kew*); Sierra Leone (*Vogel* n. 31, *h. Kew*); Niger flumen (*Baikie, h. Kew*); Caput Verde (*Bolle, h. Kew*); ins. Verde (*Moseley, h. Kew*).

Ins. Madeira (*Burchell* nn. 632, 633, *h. Kew*; *Lowe* n. 370, *h. Kew*; *Mandon* n. 255, *h. Kew*).

Ins. Azores (*Godman, h. Kew*; *H. C. Watson* n. 263, *h. Kew*; *Hunt, h. Calcutta*).

America borealis: Canada (*Goldie, h. Calcutta*); Canada occidentalis (*Macoun, h. Kew*); New Jersey (*Darlington, h. Kew*); Kentucky, Lexington (*Short, h. Kew*); Carolina borealis (*Curtiss, h. Kew*); New Orleans (*Drummond* n. 387, *h. Kew*); Mexico (*Bourgeau* nn. 526, 2386, *h. Kew*; *Hartweg* 254, *h. Kew*; *C. Wright* n. 1948, *h. Kew*).

America australis: Amazon flumen (*Traill* n. 1176, *h. Kew*); Brasil (*Swainson, h. Kew*); Peru, Lima (*Matthews* n. 427, *h. Kew*); Uruguay (*Gilbert* n. 523, *h. Kew*); Pampas (*Purdie, h. Kew*); Montevideo (*Gilbert* nn. 13, 188 [spiculis 40-floris], *h. Kew*).

Ins. Galapagos (*Anderson* n. 53, *h. Kew*).

Var. β. *helodes* (sp. Schrader); spiculis 16–30-floris, angustis, pallidis aut subfuscis.—*Nees in Mart. Brasil. Cyp.* p. 34.

Stolones tenues, tuberiferi. Spiculæ florigeræ rectangulatim patulæ. Glumæ per totam fere latitudinem striatæ.—A cl. Boeckelero *C. rotundo* appendiculato; spiculæ autem divaricatæ, glumæ striatæ.

Amazon flumen (*Spruce* n. 1127, *h. Kew*): Rio Negro, Barra (*Spruce, h. Calcutta*).

Brasil (*Burchell* n. 1656, *h. Kew*; *Swainson, h. Calcutta*).

γ. *Sprucei*; spicis densioribus; spiculis majusculis, florigeris aureis viridi-nerviis, fructiferis fuscis; glumis laxiuscule imbricatis; styli ramis longiuscule exsertis.

Spiculæ usque ad 28 mm. longæ, 3–4 mm. latæ, 32–48-floræ, sat compressæ.

[These large American forms of *C. esculentus* very possibly contain among them a separable species; for Spruce n. 6414, which may be considered the type of this var., appears to have a strictly fibrous annual root, though that is a point on which it is unsafe to rely on dried specimens that may have been seedlings of the first year and yet in flower. I wrote up this var. at Kew as *esculentus*, var. γ. *læta*; but there is another species very near this (but not it) already named *C. lætus* by Presl; so that the name *lætus* must be altered.]

America calidior: Chanduy, in litore maris Pacifici (*Spruce* n. 6414, *hh. Kew, Calcutta*); Texas (*Drummond* nn. 259, 315, 359, *h. Kew*); Mexico, Potosi, alt. 2000 metr. (*Parry et Palmer* n. 908, *h. Kew*).

136. C. LUTESCENS (*Torrey and Hook.! in Ann. Lyceum New York*, iii. p. 433); umbella subcomposita; spiculis spicatis, florigeris erecto-patulis, majusculis, densifloris, compressis, fusco-brunneis; glumis admodum compressis, ovatis, apicatis per totam fere latitudinem plane striatis.—*Chapman, Fl. South. States*, p. 508.

C. rotundus, *J. D. Hook.! in Trans. Linn. Soc.* xx. p. 177.
C. esculentus, var. γ, *Boeck. in Linnæa*, xxxvi. p. 291.

Stolones tenues: tubera in exemplis non visa. Culmi 3–4 dm., robustiores. Spiculæ longæ 3 cm., latæ 3 mm., 30–40-floræ.

America: Texas (*Drummond* n. 452, *h. Kew*); Florida (*Chapman, h. Kew*); ins. Galapagos (*Macræ, h. Kew*).

Var. *β. fulvescens*; umbella magna; spiculis magnis; glumis magnis ellipticis, remotis, fructigeris non imbricatis; styli ramis longe exsertis; nuce parva angusta.

C. fulvescens (sp.), *Liebm. Mex. Halfgr.* p. 22, *e descr.*

C. lutescens, *Torrey, Bot. U.S. and Mex. Bound. Surv.* p. 227.

Culmi 5–6 dm. Spiculæ usque ad 35 mm. longæ, 30–36-floræ.

Mexico: Tortuga (*Berlandier* nn. 980, 2410, *h. Kew*); Mexico Nova, el Paso (*C. Wright* n. 705, *h. Kew*).

137. C. CONGESTUS (*Vahl, Enum.* ii. p. 350); umbella simplice (vel fide Kunth composita); spicis breviter cylindricis, densis; spiculis undique rectangulatim patulis, lineari-lanceolatis, compressis, 8–16-floris; glumis ovatis vix acutis.—*Kunth, Enum.* ii. p. 87; *Boeck. in Linnæa*, xxxvi. p. 347.

Rhizoma lignosum, breve. Culmi 2–5 dm., trigoni. Folia cum culmo subæquilonga. Umbellæ radii 2–10, usque ad 5 cm. longæ. Spicæ 15–25 mm. in diam., 20–40-spiculosæ; rhachis 1 cm. longa, glabra. Spiculæ longæ 10–15 mm., latæ 2 mm.; rhachillæ alæ anguste oblongæ, hyalinæ, insolubiles. Nux ellipsoidea, utrinque angustata, acutius trigona, cum ½ parte glumæ fere æquilonga.

Caput Bonæ Spei (*Greville, Mrs. Miller, h. Calcutta*); Natal, alt. 1800 metr. (*Dr. Sutherland, h. Calcutta*).

Series *** *Foliatæ, a series* ** (Corymbosis typicis) *paullo recedentes vel radice fibrosa vel spiculis fasciculatis.*—Pleræque Americanæ.

138. C. AMAUROPUS (*Steud. Cyp.* p. 33); culmo a vaginis inflatis intecto, quasi-incrassato, basi ipsa tenui radicibus fibrosis; foliis longis, admodum angustis; umbella simplice; spiculis spicatis, compressis, castaneo-brunneis; glumis ovatis, obtusis, per latitudinem fere totam multinervosis.

C. leptophyllus, *Hochst. MS.*; *Boeck. in Linnæa*, xxxv. p. 641.

C. bulbosus var., *Schimper, MS. in h. Iter Abyss.* n. 1391.

Culmi 2–4 dm., tenues. Umbellæ radii 4, usque ad 2 cm. longi. Spicæ longæ 10–15 mm., 8–16-spiculosæ. Spiculæ longæ 12 mm., latæ 3 mm., 10–14-floræ; rhachillæ alæ latæ, purpureo-maculatæ, insolubiles.

Abyssinia: in lateribus montium Schoata (*Schimper* n. 1391, *h. Calcutta*).

139. C. SPHACELATUS (*Rottb. Descr. et Ic.* p. 26); viridis, radice fibrosa; umbella composita aut fere simplice; spiculis spicatis, linearibus; rhachillæ alis admodum angustis, insolubilibus.—*Kunth, Enum.* ii. p. 63; *Boeck. in Linnæa*, xxxvi. p. 292.

Brasilia: prov. Rio Negro, Barra (*Spruce, h. Calcutta*).

140. C. SETIGERUS (*Torr. and Hook. in Ann. Lyceum New York*, iii. p. 434); umbella magna, composita; umbellulis corymbosis, radiolis longius bracteatis; spiculis spicatis, acute lineari-lanceolatis.—*Boeck. in Linnæa*, xxxvi. p. 298.

[This has been issued from Kew marked *C. longus*, Linn.; and it is so exceedingly like some of the large forms of *C. longus*, Linn., that, in the absence of the rhizome, it is difficult to express an opinion whether it should be considered specifically distinct.]

Texas (*Drummond, h. Calcutta*).

141. C. STRIGOSUS (*Linn. Mant.* p. 62, *excl. syn. Sloane*); foliis bracteisque angustis, longis; umbella subsimplice; spicis cylindricis, densiusculis; spiculis rectangulatim patentibus, lineari-lanceolatis, compressis; rhachillæ alis angustis, insolubilibus.—*Kunth, Enum.* ii. p. 87; *Boeck. in Linnæa*, xxxvi. p. 346.

Radix fibrosa. Culmus basi ipsa incrassatus, aliquando conspicue bulbosus (bulbo parvo globoso). Umbellæ radii 5–6, usque ad 4 cm. longæ, 12–30-spiculosæ. Spiculæ longæ 16 mm., latæ 2–3 mm., 14–20-floræ, stramineæ aut luteæ. Nux ½ parte glumæ brevior, oblonga, trigona.

[This plant appears to me allied to *C. Thomasi*, and still more closely to *C. lucidulus*. The glumes fall one by one from the spikelets, beginning with the lowest glume and proceeding regularly upwards till the rhachilla of the spikelet is left entire still attached to the spike with only a few glumes at the apex. This is altogether the character of *Eucyperus*. It is true that subsequent to this the spikelets (very late) are broken from the spikes, as occurs also in all other species of *Eucyperus at last*. Also, in *C. strigosus*, the disk-like papillæ on the old rhachises give the suggestion of a quasi-articulation; but this is also so in *C. polystachyus* and other altogether remote species.]

America borealis: Canada (*Goldie, h. Calcutta*); Pennsylvania (*Poeppig, h. Calcutta*); Chicago (*Babcock, h. Calcutta*).

142. C. CEPHALANTHUS (*Torrey and Hook. in Ann. Lyceum New York*, iii. p. 131); foliis bracteisque longis; umbella composita, densa; umbellulis sæpe condensatis; spicis cylindricis, densis; spiculis undique rectangulatim patentibus; rhachillæ alis magnis, rotundis, subsolubilibus.

C. lætus, var. γ, *Boeck. in Linnæa*, xxxvi. p. 295.

Radix fibrosa. Culmus 4 dm., triqueter. Umbella 12 cm. in diam., densa. Spiculæ longæ 12 mm., latæ 2 mm., laxe 14-floræ.

[This species, arranged by Boeckeler in the centre of the typical Corymbosi, has been actually issued from Kew as *C. glomeratus*, Linn.; and it is so like *C. glomeratus* that, but for the extraordinary wings of the rhachilla, it might possibly be united with it. Boeckeler has, on account of these wings, removed the species to the Corymbosi; but there is nothing in the Corymbosi like the wings, to match which we must go into *Mariscus*. This is one (among many) species that leads me to think too much systematic importance has been given these wings; I doubt whether, *on the whole, C. cephalanthus* is not really nearer *C. glomeratus* than it is to anything else; the root, stem, habit, inflorescence all point that way.]

Texas (*Drummond, h. Calcutta*).

Sect. O. *Papyri*.

Papyri *et* Exaltati, *Kunth, Enum.* ii. pp. 64, 70; *Boeck. in Linnæa*, xxxvi. pp. 302, 317.

Radix fibrosa. Culmus solitarius, robustus, foliatus. Umbella magna, composita aut decomposita, spiculis spicatis, innumerosis. Spiculæ compressæ, multi- vel paucifloræ; rhachillæ alæ magnæ, solubiles, aut minus conspicuæ aut insolubiles. Glumæ parvæ, ovato-rotundæ, sæpius breviter mucronatæ. Stamina 3; antheræ longe aut breviter cristatæ vel muticæ. Nux ellipsoidea aut obovoidea, trigona aut triquetra, cum $\frac{1}{3}$–$\frac{2}{3}$ parte glumæ æquilonga.

This is a very natural group, easily recognized by the innumerable spikelets and small glumes: in some of the species small examples with a depauperated congested umbel occur, but such are rare. The wings of the rhachilla are in many species very soluble and tawny yellow; similar (though narrow) soluble tawny wings are present in some forms of *C. exaltatus* itself; and it is, I think, inconvenient to make two sections upon such a character. Our sections of *Eucyperus* are so unmanageably numerous that our object should be to throw two into one wherever possible.

* *Spiculæ lineari-lanceolatæ, rhachillæ alæ insolubiles vel angustissimæ.*

143. C. RADIATUS (*Vahl, Enum.* ii. p. 369); robusta, foliata, umbella majuscula, composita specie simplice; spicis longis, a spiculis dense antice fastigiatis, sessilibus, umbellulatis; glumis approximatis; rhachillæ alis angustis, insolubilibus; antheris muticis; nuce quam ½ pars glumæ breviore.—*Kunth, Enum.* ii. p. 71; *Boeck. in Linnæa,* xxxvi. p. 317.

C. verticillatus, *Roxb. Fl. Ind.* i. p. 206.

Radix fibrosa. Culmus solitarius (interdum cæspitosi), robustior, 3–8 dm. longus, apice (sæpe obtuse) trigonus. Folia plura, cum culmo sæpe æquilonga, 3-nervia, multistriata, in marginibus minute scabra. Involucri bracteæ 3–6, usque ad 3–5 dm. longæ, divaricatæ. Umbellæ radii 3–12, usque ad 1 dm. longi; ochreæ usque ad 2 cm. longæ, bidentatæ, dente altero usque ad 1 cm. longo, lineari. Umbellulæ bracteolatæ; radioli sæpius brevissimi, interdum 0–15 mm., sæpissime 1-spicati; spicæ ipsæ semper sessiles, nudæ (causa autem radiolorum suppressorum spicæ specie 3–7 digitatæ bracteatæ), longæ 2–6 cm., latæ 1 cm., undique a spiculis sessilibus, antice fastigiatis, densissime obsitæ. Spiculæ longæ 5–8 mm., latæ 1 mm., 16–30-floræ; gluma ima parva, non setaceo-caudata. Glumæ approximatæ, dense imbricatæ, marginibus in sicco non incurvis, late ovatæ, minute apiculatæ, compressæ, in dorso viridi-3-nerviæ, in lateribus sanguineo-striatæ, in margine lutescentes. Antheræ parvæ, anguste oblongæ. Stylus vix cum nuce æquilongus; rami 3, e gluma breviter exserti. Nux ellipsoidea, utrinque angustata, subacuta, trigona, parva, lutea aut brunnea, levis.

Species fide Boeckeler *l. c.* in tropicis Asiæ, Africæ, Americæ late sparsa; hoc loco habitat. Indicas paucas notare potui *e. g.*

Bengalia orientalis (*Griffith* nn. 6148, 6218 | 1, *h. Calcutta*).

Bengalia: Sahebgunj (*Kurz, h. Calcutta*); Dacca (*C. B. Clarke* n. 17124, *h. Calcutta*).

Assam: Gowhatty &c. (*Jenkins, Simons, h. Calcutta*).

Chittagong, alt. 0–300 metr. (*J. D. Hooker et T. Thomson*).
Pegu (*Kurz* n. 650, *h. Calcutta*).

144. C. EXALTATUS (*Retz, Obs.* v. p. 11); exaltata, foliata, umbella magna, composita; umbellularum radiolis sæpius elongatis, apice ebracteatis, 1–4-spicigeris; glumis approximatis; rhachillæ alis angustis, insolubilibus; antheris muticis; nuce cum ½ parte glumæ subæquilonga, in tribus faciebus subconcava.—*Nees in Wight, Contrib.* p. 84; *Kunth, Enum.* ii. p. 71; *Boeck. in Linnæa*, xxxvi. p. 321; *Benth. Fl. Austral.* vii. p. 285.

C. canaliculatus, *Retz, Obs.* vi. p. 20, *fide Vahl, sed?*
C. festivus, *Willd.*; *Link, Jahrb.* iii. p. 88.
C. umbellatus, *Roxb.*! *Fl. Ind.* i. p. 205, *Ic. ined.* t. 729, *in h. Kew*; *Dalz. and Gibs. Bomb. Fl.* p. 284, *nec Benth.*
C. venustus, *R. Br. Prod.* p. 217; *Thwaites, Enum. Pl. Zeyl.* p. 432; *nec Nees, nec Kunth.*
C. altus, *Nees in Wight, Contrib.* p. 84.
— Cyperus, *Wall.*! *List* n. 3328, A, B, C.
— Cyperus, *Wall.*! *List* n. 3343, A, B, C, D, E, F, G, H, I, J, K.
— Cyperus, *Wall.*! *List* n. 3327, A, B, C (forma juvenis).

Radix fibrosa. Culmus solitarius, usque ad 1 dm. longus, basi tumidus, apice triqueter. Folia plura, cum ⅔ parte culmi sæpe æquilonga, in marginibus scabra. Involucri bracteæ 3–6, usque ad 2–5 dm. longæ. Umbella 2–4 dm. in diam.; radii 5–10, usque ad 18 cm. longi; ochreæ 2–4 cm. longæ, bicuspidatæ. Spicæ longæ 2–5 cm., digitatæ, 20–40-spiculosæ. Spiculæ longæ 6–10 mm., latæ 1–2 mm., distantes, rectangulatim patentes, lanceolatæ, castaneæ, compressæ, 8–16-floræ; gluma ima rarius setaceo-caudata. Glumæ arcte stipatæ, ovatæ, minute apicatæ, in dorso viridescentes, 3-nerviæ; in lateribus castaneo-rubræ aut pallidiores lutescentes, obscure nervosæ. Stamina 3, vix exserta; antheræ lineari-oblongæ. Stylus nuce brevior; rami 3, e gluma breviuscule exserti. Nux cum ½ parte glumæ subæquilonga, ellipsoidea, utrinque angustata, apice vix acuta, plane trigona, pallide brunnea aut lutescens; cellulæ extimæ parvæ, quadratæ, persistentes.

Zeylania (*Thwaites C. P.* n. 3040, *h. Calcutta*).
Madras Peninsula (*Heyne in Wallich* n. 3343 G [C. extensus], *h. Calcutta*).
Mysore v. Carnatic (*G. Thomson* [C. altus, *Nees*], *h. Calcutta*).
Saugor (*Vicary, h. Calcutta*).
Chota Nagpore, alt. 200 metr. (*C. B. Clarke* n. 20871, *h. Calcutta*).

Rajmahl (*Wallich* n. 3328 A [C. canescens, *Ham.*], *h. Calcutta*).
Oudh (*R. Thompson* n. 362, *h. Calcutta*).
Bengal (*Wallich* n. 3343 K, *h. Calcutta*).
India centralis et mons Aboo (*G. King, h. Calcutta*).
Canton (*Hance* n. 9308 [C.? racemosus, *Retz*], *h. Calcutta*).

Var. *β. amœna*; spiculis multifloris, in spicas nutantes densas antice fastigiatis.

C. amœnus, *Koenig; Roxb. Ic. ined.* t. 731 *in hh. Kew, Calcutta; non Kunth.*

C. alopecuroides, *Roxb. Fl. Ind.* i. p. 208, *Ic. ined. in h. Calcutta; non Rottb.*

Spiculæ longæ 10–14 mm., latæ 1–2 mm., usque ad 20–50-floræ.
Calcutta (*Hort. Bot. Calcutta* [C. seminudus], *h. Calcutta; Kurz* [C. rotundus ?], *h. Calcutta; C. B. Clarke* n. 12532).
Madras Peninsula (*Wallich* n. 3329 B [C. alopecuroides, *Wight*], *h. Calcutta; Wight* n. 2863; *Heyne in Wallich* n. 3343 A [C. maximus ,C. distachyos ?, *Vahl*], *hh. Calcutta, Madras* [C. fastigiatus], *h. Calcutta; Heyne in Wallich* n. 3343 D [C. spicatus], *h. Calcutta*; Gingee, *Wight in Wallich* n. 3343 H [C. verticillatus, *Roxb.*], *h. Calcutta*).
Zeylania (*Thwaites C. P.* n. 3788 [C. venustus, *R. Br.*], *h. Calcutta*).
[Forma *assamica*; spiculis minus numerosis, majoribus, latioribus. Assam (*Wallich, Griffith et Jenkins, h. Calcutta*).]

Var. *γ. dives*, Delile, Egypt. v. t. 4. fig. 3 (sp.); spiculis dense spicatis, undique rectangulatim patentibus, lucide brunneis aut aureis; glumis approximatis, breviter mucronatis; rhachillæ tenuis alis angustis, insolubilibus; stylo trifido; nuce ellipsoidea aut subovoidea, trigona, cum ½ parte glumæ vix æquilonga.—*Kunth, Enum.* ii. p. 71.

C. alopecuroides, *Boeck. in Linnæa*, xxxvi. p. 322, var. *a*, *nec Rottb.*

Umbella quam in *C. exaltato* typico rigidius, divaricato-corymbosa, lutescens; spiculæ longiores, crassiores, subturgidæ, lucide flavido-brunneæ, 30–40-floræ; gluma ima sæpius longe setaceo-acuminata.

The type specimens of this at Kew agree exactly with my Calcutta example, so that if *C. dives* is a distinct species, it is an Indian one. The specimens differ from those of Retz's *exaltatus* by the much more numerous glumes to the spikelet, while they differ from those of Koenig's *amœnus* in the rigid, not tasselled, nodding spikes. *C. dives* may therefore yet be held a distinct species; but whatever it is considered, it must be remote from *C. alopecuroides*, Rottb., which has a 2-fid style, a compressed nut, and a very thick rhachilla.

Egypt: Rosetta (*h. Calcutta*).

Calcutta: Mutlah (*C. B. Clarke* n. 24707, *h. Calcutta*).

Var.? δ. *Oatesii*; inflorescentia ut in *C. exaltato* typico; spiculis nitidis, pallidis, 14-floris; rhachillæ alis parvis, linearibus, flavidis, mox solutis; nuce magna, cum $\frac{2}{3}$ parte glumæ æquilonga, trigona, pallida.

Spiculæ angustæ. Nux cum $\frac{3}{4}$ parte glumæ interdum æquilonga.—Species fortasse bona, sectionem Papyrum cum Exaltatis arcte conjungens; cum *C. exaltato*, Retz, admodum affinis.

Burma: Thyat Myo (*Eug. Oates, h. Calcutta*).

** *Rhachillæ alæ conspicuæ, solubiles; spiculæ anguste lineares; antheræ sæpe cristatæ.*

145. C. AURICOMUS (*Sieber*; *Spreng, Syst.* i. p. 230); exaltata, foliata; umbella magna, composita aut decomposita; spicis longis, digitatis; spiculis densis, multifloris, undique rectangulatim patentibus, linearibus, basi bracteolatis; glumis remotiusculis; rhachillæ alis lanceolato-rhomboideis, flavidis, solutis; antheris muticis; nuce cum $\frac{1}{2}$ parte glumæ æquilonga, oblongo-ellipsoidea, trigona, apice breviter cylindraceo-umbonata.

C. digitatus, *Roxb. Fl. Ind.* i. p. 205.

C. venustus, *Kunth, Enum.* ii. p. 68; *Boeck. in Linnæa*, xxxvi. p. 316 (*non R. Br.?*).

C. Neesii, *Kunth, Enum.* ii. p. 101, *syn. Linn. excl.*; *Boeck. in Linnæa*, xxxvi. p. 315.

C. racemosus, *Kunth, Enum.* ii. p. 100, quoad syn. citat., nec quoad descript., *nec Retz.*

Radix valide fibrosa. Culmus solitarius, 3–8 dm. longus, sursum trigonus vel triqueter. Folia plura, cum $\frac{2}{3}$ parte culmi sæpe æquilonga, in marginibus scabra. Involucri bracteæ 5–8, usque ad 5 dm. longæ, divaricatæ. Umbella 1–6 dm. in diam., composita aut decomposita; radii 4–10, sæpe 1 dm. longi; ochreæ 1–3 cm. longæ, apice 2-cuspidatæ. Umbellularum bracteolæ 3–5, foliaceæ, cum umbellulis sæpe æquilongæ. Spicæ 2–4 cm. longæ; rhachis glabra a glumis imis spicularum persistentibus undique dense ornata. Spiculæ lineares, compressæ, 10–24-floræ, quoad magnitudinem variabiles; in *C. auricoma* Sieb. typico angustæ subteretes, aciculares, glumis densius imbricatis; in *C. Neesii* latiusculæ, laxiuscule 10-floræ; in forma majuscula (in Assam &c. vulgari) longæ 16 mm., 20-floræ, multum compressæ, glumis longioribus, remotiusculis; rhachillæ alis magnis, caducis. Glumæ ovatæ aut ellipticæ, compressæ, dorsi nervi 3, virides, in acumen excurrentes, latera rubra vel saturate colorata, margines scariosi. Stamina 3; antheræ lineari-oblongæ. Stylus nuce brevior; rami 3, e gluma breviter exserti. Nux paullo unsymmetrica, curvata, obtuse trigona, apicem versus in brevem cylindrum subito angustata; stylobasis ab apice cylindri obtusi facile secedens. Nux nigra; cellulæ extimæ quadratæ, crassæ, albidæ.

This plant is the *C. auricomus* of h. Kew; but the synonymy I did not work at Kew, and cannot discover at Calcutta. The localities following are *all* from the Calcutta Herbarium:—

India Orientalis: Moradabad (*T. Thomson* [C. auricomus, *Sieber*]); Sikkim Terai (*G. King*); Assam (*Jenkins*, *Simons*, *Masters*); Khasia; Nongram, alt. 1400 metr. (*C. B. Clarke*); Bengal; Rajapore Jheel (*Kurz* [C. digitatus, *Roxb.*]); Bengal (*Hooker f. et T. Thomson* [C. auricomus, *Sieber*]); Bengal orientalis (*Griffith* n. 6149); Dacca (*C. B. Clarke* nn. 7417, 17131 B); Nilgherries, alt. 1900 metr. (*C. B. Clarke* n. 11363; *G. King* n. 1318); Zeylania (*Thwaites C. P.* n. 3043).

Burma: Meaday (*R. Scott*); Pegu (*Kurz* nn. 647, 672, 2672); Attran et Pagamew (*Wallich* n. 3438 [C. digitatus, *Roxb.*]).

Egypt (*Sieber* n. 42).

Nupe, in flumine Niger (*Barter*)

Brasil (*Swainson*).

Var. β. *khasiana*; nuce apice acutata in stylobasin sensim transeunte.

C. Hookeri, *Boeck. in Linnæa*, xxxvi. p. 308.

Papyrus elatus, *Hook. f. et T. Thoms. MS., non Nees.*

Bengalia orientalis (*Griffith* n. 6151).

Khasia v. Assam (*Wallich et Griffith, Assam Deputation*).

Khasia: regio tropicalis (*Hooker f. et T. Thomson* n. 23 [Papyrus elatus, *Nees*]).

Khasia: Sohra Reen, alt. 1600 metr. (*C. B. Clarke* n. 19173).

146. C. ELATUS (*Linn. Amœn. Acad.* iv. p. 301, *Sp. Pl.* p. 67); robusta, foliata; umbella magna, decomposita; spicis elongatis, densis; spiculis parvis, angustis, antice fastigiatis; antherarum arista cum ½ parte loculorum subæquilonga.

C. racemosus, *Retz, Obs.* vi. p. 20 (?); *Kunth, Enum.* ii. p. 101; *Boeck. in Linnæa,* xxxvi. p. 311.

Cyperus, *Wall.*! *List* n. 3341 A.

Radix valide fibrosa. Culmus solitarius, 3–8 dm. longus, apice triqueter fere levis. Folia cum ⅔ parte culmi æquilonga, in marginibus scabra. Involucri bracteæ 4–8, divaricatæ, usque ad 5 dm. longæ. Umbella 3–4 dm. in diam.; radii 1–2 dm. longi, robusti: ochreæ 3–5 cm. longæ, apice in altero latere foliaceo-lanceolatæ; umbellularum bracteolæ 3–6, cum umbellulis sæpe æquilongæ. Spicæ in umbellula secundaria numerosæ, usque ad 8–16, longæ 5–7 cm., latæ 5–7 mm., 20–50-spiculosæ; rhachis a spiculis tecta. Spiculæ longæ 5–7 mm., latæ 1 mm., 12-floræ, luteo-fuscæ, parum compressæ, basi non (aut obscure) bracteolatæ; rhachillæ alæ magnæ, late lanceolatæ, flavidæ, mox solutæ. Glumæ ovatæ, compressæ, vix mucronatæ, in dorso virides 3-nerviæ, in marginibus scariosæ. Stamina 3; antheræ parvæ, oblongæ, flavæ, a crista lineari-lanceolata scabra rubra coronatæ. Stylus brevis; rami 3, e gluma breviter exserti. Nux cum ½–⅔ parte glumæ subæquilonga, ellipsoidea, sursum angustata, trigona, nigra; cellulæ extimæ quadratæ, albidæ, crassæ.

Penang (*Wallich* n. 3341 A, *h. Calcutta*).

Java (*Kurz* n. 2751, *h. Calcutta*).

Var. *β. macronux*; umbella specie composita; umbellularum bracteolis umbellulas longe superantibus; spiculis minus numerosis, majoribus, subpatentibus; nuce vix quam sit gluma breviore.

Bengal: Comilla (*C. B. Clarke* n. 14188, *h. Calcutta*).

[I believe I have written this variety up in h. Kew as a distinct species.]

147. C. PLATYPHYLLUS (*Roem. et Sch. Syst.* ii. p. 876); maxima, foliis latis; umbella composita; spicis elongatis, a spiculis dense fastigiatis; antherarum crista lineari-lanceolata cum ⅔ parte loculorum æquilonga.

C. elatus, *Roxb. Fl. Ind.* i. p. 204, *non Linn.*

C. maximus, *Roxb. MS. in. h. propr.*

C. eminens, *Klein*; *Kunth, Enum.* ii. p. 70; *Boeck. in Linnæa,* xxxvi. p. 312.

C. Roxburghii, *Nees in Wight, Contrib.* p. 84.

Cyperus, *Wall.*! *List* n. 3341 B, *h. propr.*

Radix valide fibrosa. Culmus solitarius, 7–14 dm. longus, crassus, basi teres, sursum acute triqueter, in angulis serrato-scaber, manus incautas secans. Folia 5–10 dm. longa, 2–3 cm.

lata, in marginibus scabra. Involucri bracteæ 4–6, usque ad 5 dm. longæ. Umbella 3–4 dm. in diam.; radii 10–15 cm., robusti; ochreæ 3 cm., bicuspidatæ. Umbellularum bracteolæ parvæ, 1–3 cm. longæ; radioli 3–8, breves. Spicæ longæ 5 cm., latæ 8 mm., 1–4-digitatæ. Spiculæ longæ 8 mm., latæ 2 mm., 10–14-floræ, pallidæ; rhachillæ alæ magnæ, late lanceolatæ, flavidæ, solubiles. Glumæ arctius imbricatæ, compressæ, marginibus in sicco non incurvatis, in dorso viridescentes, 3-nerviæ, in lateribus stramineo-fuscæ, obscurius multistriatæ. Stamina 3; antherarum loculi flavi; crista rubra, scabra. Stylus brevis; rami 3, e gluma breviter exserti. Nux ellipsoidea, sursum angustata, trigona, cum $\frac{1}{2}$–$\frac{2}{3}$ parte glumæ æquilonga; cellulæ extimæ albæ, crassæ, quadratæ.—Species *C. elato* affinis, ab hoc bene distincta; culmus major, apice serrato-scaberrimus; umbellularum bracteolæ multo minores; spiculæ majores; antheræ majores, longius appendiculatæ.

Zeylania (*Thwaites C. P.* n. 3041, *h. Calcutta*).

148. C. Papyrus (*Linn. Sp. Pl.* p. 70); umbellæ radiis usque ad 100, 1–2 dm. longis; involucri bracteis umbella multo brevioribus.—*Kunth, Enum.* ii. p. 64; *Boeck. in Linnæa*, xxxvi. p. 304.

Rhachillæ alæ lanceolatæ, caducæ. Anthera oblonga, apice acutata vix cristata. Nux cum $\frac{2}{3}$ parte glumæ æquilonga, ellipsoidea, utrinque angustata, trigona.

In Calcutta Hort. Bot. culta.

Subgenus 5. Diclidium.

Diclidium, *Nees in Martius, Fl. Brasil. Cyp.* p. 51, t. 1, 2 (genus Schrader); *Boeck. in Linnæa*, xxxvi. p. 392; *Benth. et Hook. f. Gen. Pl.* iii. p. 1045.

Spiculæ rhachilla per articulos disjuncta; gluma persistens cum articulo decidua; rhachillæ alæ conspicuæ, hyalinæ, nucem amplectentes, insolubiles.

Umbella composita vel decomposita, sæpius laxa. Spiculæ spicatæ, subulatæ, subteretes. Glumæ remotiusculæ. Antheræ muticæ. Stylus 3-fidus. Nux trigona, æqualis vel curvata.

149. C. ferax (*A. Rich. in Act. Soc. Hist. Nat. Paris*, i. p. 106); robusta, foliata; umbella composita, specie subsimplice; spicis longis undique patentim spiculosis; spiculis pauci- vel multifloris, linearibus, teretibus, sæpe curvatis.—*C. B. Clarke in Journ. Linn. Soc.* xx. p. 295, cum syn.

Radix fibrosa. Culmi solitarii, aut ope progemmationis basalis 2–3ni, longi 3–5 dm., apice trigoni. Folia plura cum $\frac{2}{3}$ parte culmi subæquilonga, in marginibus scabra. Involucri bracteæ (in umbellis majoribus) usque ad 3–4 dm. longæ, validæ, in marginibus scabræ; in umbellis interdum contractis vix 1 dm. longæ, debiliores. Umbella 1 dm. in diam. contracta, spicis densa, aut usque ad 5–6 dm. in diam., radiis longis 2 dm., validis; ochreæ usque ad 5 cm. longæ, in altero lâtere foliaceo-appendiculatæ. Umbellulæ divaricato-corymbosæ; bracteolæ cum $\frac{2}{3}$ parte umbellulæ sæpæ æquilongæ. Umbellula specie simplex sed revera sæpius iterum divisa, *i. e.* radioli plus minus elongati, conspicue ochreati, apice 1-paucispicigeri. Spiculæ longæ 5–25 mm., in diam. 1–2 mm., 5–15-floræ; gluma ima lanceolata, setaceo-caudata. Glumæ distantes, parum imbricatæ, arcte adpressæ; rhachilla suberosa alternatim excavata; articulus unusquisque e nuce in rhachilla abscondita cum gluma floris superioris exstructus. Glumæ late ovatæ, obtusæ, minute (aut non) apiculatæ, in dorso rotundatæ, rubro-striatæ. Stamina 3; antheræ muticæ. Stylus brevissimus; rami 3, e gluma breviter exserti. Nux anguste oblonga, cum $\frac{2}{3}$ parte glumæ æquilonga, utrinque breviter angustata, nigra; cellulæ extimæ quadratæ, tenues, hyalinæ.

Mr. Bentham in herb. Kew has treated this as a composite species, widely spread in the tropics of both hemispheres, and I followed him in Journ. Linn. Soc. xx. p. 295. I made no notes on this species at Kew, and therefore here at Calcutta can only refer to that place for the synonymy and geography. The description above is from the following:—

Bengal: Furidpore (*C. B. Clarke* n. 7511, *h. Calcutta*).

Pegu (*Kurz* n. 2686, *h. Calcutta*).

Borneo (*Barber*, *h. Calcutta*).

150. C. MICHAUXIANUS (*Torrey in Ann. Lyceum New York*, iii. p. 259); robusta, foliata; umbella composita; spicis cylindricis, densis; spiculis rectangulatim patentibus, linearibus, subteretibus, 6-floris; glumis remotis, ovatis, obtusis.—*Boeck. in Linnæa*, xxxvi. p. 400.

Radix fibrosa. Culmus 4 dm. Folia lata 5 mm. cum culmo fere æquilonga. Umbella 7-radiata, 8 dm. in diam. Nux cum $\frac{2}{3}$ parte glumæ æquilonga, oblonga, subtrigona, curvata, luteobrunnea.

Florida (*Chapman*, *h. Calcutta*).

151. C. NEMACAULOS (*Steud. Cyp.* p. 43); foliis bracteisque longis, tenuibus; umbella simplice densiuscula; spiculis spicatis, linearibus, longis, patentibus; glumis remotis, adpressis; nuce longa, angusta.

C. filiculmis, *Schrader*; *Nees in Mart. Brasil. Cyp.* p. 40, *non Vahl.*

Rhizoma perenne, tenue. Culmi 4 dm., tenues. Spicæ longæ 10–25 mm., 10–22-spiculosæ. Spiculæ longæ 22 mm., latæ 1–2 mm., 12-floræ. Glumæ oblongæ, obtusæ. Rhachillæ alæ angustiores, insolubiles.

Para: Santarem (*Spruce, h. Calcutta*).

Subgenus 6. MARISCUS (char. ampliato).

Mariscus, *Vahl, Enum.* ii. p. 372 (genus); *Kunth, Enum.* ii. p. 115 (genus); *Boeck. in Linnæa* (Leptostachyis inclusis), xxxvi. p. 372; *Benth. et Hook. f. Gen. Pl.* iii. p. 1045.

Stylus 3-fidus; glumæ persistentes; spiculæ caducæ.—Foliatæ. Spiculæ sæpius paucifloræ, interdum 1-floræ (*i. e.* 4–5-glumæ, glumis 2 imis vacuis, tertia hermaphrodita, nucigera, quarta mascula vel vacua depauperata) rarius multifloræ. Rhachillæ alæ latæ vel angustæ, insolubiles, sæpius conspicuæ. Rhachilla continua, sæpe crassiuscula aut alternatim excavata, cum glumis supra glumam secundam articulatim caduca. Glumæ 2 imæ vacuæ (ima sæpe caudata, secunda sæpius parva truncata), sæpe post casum spiculæ persistentes. Stamina 3; antheræ lineari-oblongæ, muticæ. Nux trigona, haud raro inæqualis, sæpius majuscula haud raro angusta.

[I have not before me a sufficiently large number of species to propose a complete arrangement: the following "sections" are merely a list of the Indian species, with notes on some non-Indian that appear allied to them.]

* *Spiculæ aciculares plurifloræ, umbella sæpius composita* (Leptostachyi, *Boeck.*).

152. C. DILUTUS (*Vahl, Enum.* ii. p. 357); robusta, foliata; umbella simplice aut composita; spicis stellato-globosis; spiculis 3–9-floris, linearibus; nuce anguste oblonga, acuminata, rostrata. —*Kunth, Enum.* ii. p. 92; *Boeck. in Linnæa,* xxxvi. p. 354.

C. spinulosus, *Roxb. Fl. Ind.* i. p. 20.

Radix robuste fibrosa. Culmi solitarii, aut sæpe cæspitosi, 3–5 dm. longi, sursum teretes, vix trigoni, leves. Folia plura, lata, basi longe vaginata, spongioso-incrassata, sursum in marginibus spinuloso-scabra. Involucri bracteæ 4–8, usque ad 2–4 dm. longæ. Umbella sphærica, 1–2 dm. in diam.; ochreæ inconspicuæ. Spicæ ebracteatæ, usque ad 3 cm. in diam. (sæpius multo minores), rubro-brunneæ aut cinnamomeæ, 15–40-spiculosæ. Spiculæ dense digitatæ (brevissime spicatæ) lineares, compressæ, usque ad 15 mm. longæ, 12–14-floræ (sæpius multo minores 3–6-floræ); rhachilla tenuis, continua, supra glumam secundam articulatim decidua; alæ oblongæ, hyalinæ, insolubiles. Glumæ ellipticæ, obtusæ, multinervosæ. Stamina 3; antheræ oblongæ, muticæ. Stylus brevis; rami 3, e gluma breviter exserti. Nux (rostro incluso) cum $\frac{3}{4}$ parte glumæ æquilonga, anguste oblonga, trigona, nigro-brunnea; cellulæ extimæ quadratæ, tenues, inconspicuæ.

[India Orient. Malacca. Java. Ins. Philippinenses, fide Boeckeler; the subjoined localities are all from the Calcutta Herbarium.]

Bengalia orientalis (*Griffith* n. 6245).
Bengal: Sahebgung (*Kurz*); Sylhet (*C. B. Clarke* n. 6960).
Planities Gangetica superior (*T. Thomson*; *Falconer* n. 1143).
Assam (*Jenkins*, *Simons*); Suddiya (*Griffith*).
Khasia colles (*J. D. Hooker et T. Thomson* n. 28).
Madras Peninsula (*Wight in h. Wallich* n. 3439; *G. Thomson*).
Zeylania (*Thwaites C. P.* n. 815).
Pegu (*Kurz* nn. 660, 661, 2671); Sittang (*R. Scott* n. 397).
Ins. Penang (*Wallich* n. 3439).
Ins. Andaman et Nicobar (*Kurz*).
Malaya: Goping (*h. Calcutta* n. 952).

[Allied to *C. dilutus* are *C. lucidus*, R. Br., *C. multifolius*, Kunth, *C. incompletus*, Link, *C. nitidulus*, Boeck., *C. dissitiflorus*, Torrey, &c., but they all have the spikes much more elongate.]

** *Umbellulæ divaricato-corymbosæ; spiculæ lanceolatæ, subteretes, pluriflora.*

153. C. PENNATUS (*Lam.*; *Poir. Encycl.* vii. p. 240); robusta; foliis bracteisque longis, spongiosis; umbella decomposita; spiculis divaricatis, 5–12-floris, pallidis subrubescentibus; glumis arcte imbricatis.—*Kunth, Enum.* ii. p. 80; *Benth. Fl. Austral.* vii. p. 284.

C. canescens, *Vahl, Enum.* ii. p. 355; *Boeck. in Linnæa*, xxxvi. p. 340.

Radix valide fibrosa. Culmus solitarius, 3–7 dm. longus, crassiusculus, sursum trigonus. Folia plura, cum culmo sæpe æquilonga, basi longius vaginata. Involucri bracteæ 3–5, usque ad 5 dm. longæ, divaricatæ, in marginibus scabræ. Umbella 1–3 dm. in diam., rigida, divaricata, densa; radii 6–12, usque ad 5–8 cm. longi; ochreæ 1–2 cm. longæ, apice unidentatæ. Umbellularum radioli 1–2, corymbosi, divaricati (umbella sæpe specie simplex); bracteolæ parvæ, rarius 1 cm. longæ. Spicæ 1–2 cm. longæ, 10–24-spiculosæ; rhachis glabra; spiculæ undique rectangulatim (et subretrorsim) patentes, lanceolatæ, subteretes, supra glumam secundam articulatim caducæ, 5–14-floræ, pallidæ, subturgidæ; rhachilla alternatim excavata; alæ hyalinæ, latiusculæ, insolubiles. Glumæ semper imbricatæ, concavæ, ovatæ, obtusæ, 9–11-striatæ, stramineo-griseæ, pallide purpureo-maculatæ. Stamina 3; antheræ lineari-oblongæ, muticæ. Stylus nuce brevior; rami 3, longiusculi. Nux obovoidea, acute trigona, cum $\frac{1}{3}$ parte glumæ æquilonga, nigra; cellulæ extimæ lucide albæ, minute porosæ.

[I know no species to compare with this. The subjoined localities are from the Calcutta Herbarium: the plant also grows in Australia and the Seychelles.]

Bengalia orientalis (*Griffith* n. 6159).
Calcutta (*C. B. Clarke* n. 24705).
Madras Peninsula (*Wight* n. 2866).
Zeylania (*Thwaites C. P.* n. 678).
Moulmein (*Wallich* n. 3359 E).
Arracan et ins. Andaman (*Kurz*).
Burma v. Malay Peninsula (*Griffith* n. 6159).
Tenasserim v. Andamans (*Helfer* n. 6159).
Borneo (*Barber*).

*** *Spiculæ oblongæ* 3–6-*floræ, plus minus compressæ; umbella composita spicis cylindricis, vel subsimplex spicis densissimis.*

154. C. Seemannianus (*Boeck. in Linnæa*, xxxvi. p. 390); umbellæ specie simplicis radiis elongatis, digitatim 1–4-stachyis; spicis cylindricis usque ad 60-spiculosis; spiculis rectangulatim patentibus, 4–7-glumis, 1–3-nucigeris; nuce obovoidea, triquetra, apicata.

Mariscus lævigatus, *Hook. et Arn. Bot. Beechey Voy.* ii. p. 72, *non Roem. et Sch.*

An differt *C. monostachys*, Boeck. in Linnæa, xxxvi. p. 389?

Ins. Feejee (*Seemann* n. 669, *h. Calcutta*; *Milne, h. Calcutta*).

155. C. ANDERSSONII (*Boeck. in Linnæa*, xxxvi. p. 388); umbella simplice; spicis digitatis, densis, cylindricis, terminali sæpius multo longiore; spiculis anguste oblongis, 2–4-floris; nuce cum $\frac{3}{4}$ parte glumæ æquilonga, ellipsoidea, utrinque angustata, triquetra.

(A Kew sub nomine *C. brachystachyo*, Hook. f., distributa.)

Ins. Galapagos (*Douglas, h. Calcutta*).

[Allied closely to this last appear to be *Mariscus Mutisii* et *M. Jacquini*, H. B. K., to one of which I suppose Fendler n. 1601, from Tovar in Venezuela, to belong.]

156. C. LIGULARIS (*Linn. Amoen. Acad.* v. p. 31, *Sp. Pl.* p. 70); robustior, foliacea; umbella specie simplice; spicis cylindricis, densissimis, digitatim 1–3nis; spiculis 3–5-floris, rufescentibus; rhachillæ (in articulos insolubilis) alis latis insolubilibus; nuce acute triquetra, acuta, inæquali.—*Kunth, Enum.* ii. p. 69; *Boeck. in Linnæa*, xxxvi. p. 332; *C. B. Clarke in Journ. Linn. Soc.* xx. p. 295.

Mariscus brachystachyus, *Hook. in Trans. Linn. Soc.* xx. p. 179.

Africa; Australia; America tropicalis.

Para: Santarem (*Spruce, h. Calcutta*).

Galapagos archip.: James et Charles ins. (*Douglas, h. Calcutta*).

157. C. FLAVUS (*C. B. Clarke, nec Presl, nec Boeck.*); involucri bracteis numerosis, longis; umbella simplice, congesta, radiis subnullis; spicis cylindricis, densis; spiculis 3–6-floris, 2–4-nucigeris; nuce cum $\frac{1}{3}$ parte gluma æquilonga, late ellipsoidea, utrinque subacuta, acute trigona, paullo inæquali, castanea.

Mariscus flavus, *Vahl, Enum.* ii. p. 374; *Kunth, Enum.* ii. p. 118.

Rhizoma perenne. Culmi 3 dm., robustiores, apice triquetri. Folia plura 5–6 mm. lata, cum culmo æquilonga. Involucri bracteæ 4–7, usque ad 18 cm. longæ, divaricatæ.

Para: Santarem (*Spruce, h. Calcutta*).

This species is exceedingly like *C. ligularis*, but has the rays of the umbel obsolete. I am very possibly wrong (in the absence of authentic type specimens) in taking it as the original *Mariscus flavus*; but it certainly is not Boeckeler's *Cyperus flavus* (Linnæa, xxxvi. p. 384), which has the nut "late obovata basi leviter angustata apice obtusissima, subretusa, apicata," and is a plant exceedingly like in general aspect to what I call *C. flavus*, but has a totally different nut, and is = Holton n. 116, from La Paila in New Granada.

**** *Umbella simplex vel subcapitata, spiculæ pluriflora, digitato-fasciculatæ; glumæ subdistantes.*

158. C. DUBIUS (*Rottb. Descr. et Ic.* p. 20, t. 4. fig. 5); culmis cæspitosis, foliatis; spicis 2–5 in capitulum unicum congestis; spiculis lineari-oblongis, turgidis, 3–5-floris.—*Roxb. Fl. Ind.* i. p. 189; *Boeck. in Linnæa*, xxxvi. p. 336; *C. B. Clarke in Journ. Linn. Soc.* ii. p. 285.

C. kyllingiæoides, *Vahl, Enum.* ii. p. 312; *Kunth, Enum.* ii. p. 94, *non Pursh.*

Radix fibrosa. Culmi plures, 2–3 dm. longi, basi paullo tumidi, a vaginis pluribus laxis rubescentibus intecti, apice triquetri. Folia plura, angusta, debilia, viridia, cum culmo sæpe æquilonga. Involucri bracteæ plures, longæ 8–16 cm., flaccidæ. Capitulum 8–16 mm. in diam., albo-viridis. Spiculæ undique divaricatæ, densæ, 5–8 mm. longæ; rhachillæ alæ lanceolatæ, hyalinæ, insolubiles. Glumæ imbricatæ, longe 2 mm., late ovatæ, obtusæ, compressæ, per totam fere latitudinem 15–19-nerviæ. Stamina 3; filamenta linearia, levia; antheræ lineari-oblongæ, muticæ, rubræ. Stylus nuce brevior; rami 3, e gluma breviter exserti. Nux cum $\frac{2}{3}$ parte glumæ æquilonga, ellipsoidea utrinque angustata, trigona, nigra; cellulæ extimæ quadratæ, hyalinæ.

In endeavouring too hastily to compress the number of sections of *Cyperus* (in Journ. Linn. Soc. xx. p. 285) I have put this species with *C. niveus* and the capitate set of *Eucyperus*: this I now call a great error. This species has been issued from Kew as *Mariscus Kraussii*, Hochst.; but Boeckeler says *M. Kraussii* is altogether different.

Malay Peninsula: Wellesley (*G. King, h. Calcutta*); ins. Penang (*h. Calcutta* n. 1724); in oris Burmæ australis (*Kurz, h. Calcutta*).

Madras Peninsula (*Wight et Heyne in Wallich* n. 3326, *h. Calcutta*; *G. Thomson, h. Calcutta*).

Ins. Zeylania (*Thwaites C. P.* n. 2942, *h. Calcutta*).

Ins. Mascarene: Madagascar, Seychelles, Rodriguez, Comoro.

Africa australis: Portus Natal (*Grant, h. Calcutta*).

159. C. ISCHNOS (*Schlecht. Bot. Zeit.* 1849, p. 99); tenuiter

stolonifera; capitulo congesto; nuce late obovoidea vel exacte oblonga.

I have no specimen. I saw at Kew Hooker f. et T. Thomson n. 25, and it appeared conspecific with the American specimens. Here I am only copying Boeck. in Linnæa, xxxvi. p. 334.

India Orientalis (Madras Peninsula). Mexico. Columbia.

160. C. BALDWINII (*Torrey in Ann. Lyceum New York,* iii. p. 270); umbella simplice; spiculis dense breviter spicatis aut fere fasciculatis, substellatis, linearibus, acutis, parum compressis, 7-floris; glumis ovatis, obtusis, multinerviis; rhachillæ alis latis, insolubilibus.—*Boeck. in Linnæa,* xxxvi. p. 357.

Rhizoma lignescens, horizontalis; culmi parum distantes, basi globoso-bulbosi, 3 dm. longi. Folia angusta, viridia. Involucri bracteæ 6, usque ad 15 cm. longæ, divaricatæ. Umbellæ radii 4–9, usque ad 6 cm. longi, tenues. Spicæ 10–18 mm. in diam., 5–20-spiculosæ. Spiculæ longæ 7–8 mm., latæ 1 mm. Glumæ subremotæ. Nux cum $\frac{2}{3}$ parte glumæ æquilonga, late oblonga vel subellipsoidea, obtuse trigona, fere symmetrica, utrinque brevissime angustata, nigra; cellulæ extimæ quadratæ, hyalinæ.

Florida (*Chapman, h. Calcutta*).
New Orleans (*Drummond, h. Calcutta*).
New Jersey (*Buckley, h. Calcutta*).

161. C. SETIFOLIUS (*Torrey, non D. Don*); foliis angustis cum culmo æquilongis; umbella simplice; spiculis in apice radiorum stellato-globosis, fusco-viridibus, 6–12-floris; glumis ovatis truncatis per totam fere latitudinem multinerviis; nuce cum gluma subæquilonga, late oblonga aut subellipsoidea, trigona.

C. Grayii, *Torrey in Ann. Lyceum New York,* iii. p. 260.
C. filiculmis, var. Grayii, *Boeck. in Linnæa,* xxxv. p. 609.

New Jersey: Pines (*A. Gray, h. Calcutta*).

In these excellent specimens, communicated and named by A. Gray, the wing of the rhachilla is very broad; and the plant appears to me exceedingly near *C. Baldwinii*, and very far removed from *C. filiculmis*, in which the wing of the rhachilla is exceedingly narrow. It is possible, indeed, that A. Gray has sent the wrong plant under the name *C. setifolius*; but I think not. It is not the business of the present article to review critically American species; but I wish to point out that in this part of the series also the wing of the rhachilla has been probably made of too much importance as a sectional character, and that *C. filiculmis* perhaps should be removed to this neighbourhood.

***** *Umbella simplex, spiculæ paucifloræ* 1–2-(*rarissime* 3–4-) *nucigeræ.*

162. C. OVULARIS (*Torrey in Ann. Lyceum New York*, iii. p. 278); foliis bracteisque longis; umbella simplice, radiis longis apice a spicis globosis densis terminatis; spiculis 3–4-floris 1–2-nucigeris.—*Boeck. in Linnæa*, xxxvi. p. 376, var. *α* excl.

Mariscus ovularis, *Vahl, Enum.* ii. p. 374.

Alabama; New Jersey; Florida (*h. Calcutta*).

163. C. RETROFRACTUS (*Asa Gray, Man.* ed. ii. p. 494, *non Engelmann*); undique pubescens; umbella simplice; spiculis in apice radiorum longorum dense stellatis (inferioribus sæpe retrofractis), linearibus, acutis, 1-nucigeris.—*Boeck. in Linnæa*, xxxvi. p. 365.

Mariscus retrofractus, *Vahl, Enum.* ii. p. 375.

Louisiana (*Drummond, h. Calcutta*).

Sierra Leone (*Vogel* n. 41, *h. Calcutta*).

164. C. BIGLUMIS; robustior; umbella simplice; spicis ovoideis aut breviter cylindricis, densis, breviter pedunculatis aut congestis; spiculis majusculis, anguste lanceolatis, 3–6-floris, 2–3-nucigeris, flore infimo quam sit spicula multo breviore.

Mariscus biglumis, *Gærtn. Fruct.* i. p. 12, t. 2. fig. 8.

M. paniceus, *Kunth, Enum.* ii. p. 119 *pro parte* (*syn. Rottb. excl.*).

Radix perennis, valida, fibrosa; stolones laterales breves. Culmi 3–5 dm. longi, acute trigoni. Folia plura, culmum sæpe superantia, lata 5–8 mm. Involucri bracteæ 3–8, usque ad 2–3 dm. longæ. Spicæ 3–9, usque ad 100-floræ, 1–3 cm. longæ, densissimæ; pedunculi 0–2 cm. Spiculæ usque ad 15–18 mm. longæ, 6-floræ, sæpius 8–10 mm. longæ, 3–4-floræ. Glumæ ellipticæ, obtusæ, parum compressæ, in dorso viridi-nervosæ, in lateribus late enerviæ, pallidæ, rubro-maculatæ aut viridi-notatæ, marginibus ipsis in sicco incurvatis. Nux cum $\frac{2}{3}$ parte glumæ æquilonga, late oblonga, trigona, in una facie concava.—Sp. sequentis fortasse pro var. *insigni* melius habenda.

Zeylania (*Thwaites C. P.* n. 816, *h. Calcutta*).

Assam (*Jenkins, h. Calcutta*).

Ins. Andaman (*Kurz, h. Calcutta*).

Sumatra: Lamponga (*Forbes* n. 1620, *h. Calcutta*).

165. C. UMBELLATUS (*Benth. Fl. Hongk.* p. 386, *non Roxb.*); viridis; umbella simplice aut congesta; spicis solitariis (rarissime 1–3 digitatis ebracteatis) elongato-cylindricis aut brevioribus aut globosis, sæpissime multispiculosis; spiculis 1–4-floris, nucem unicam maturantibus.

C. ovularis, *Boeck. in Linnæa,* xxxvi. p. 337, var. *a, non Torrey.*
Kyllinga umbellata, *Linn. f. Suppl.* p. 105; *Rottb. Descr. et Ic.* p. 15, t. 4. fig. 2; *Roxb. Fl. Ind.* i. p. 182.
Mariscus umbellatus, *Vahl, Enum.* ii. p. 376; *Kunth, Enum.* ii. p. 118.
M. polyphyllus, *Steud.* ! *in Flora*, 1842, p. 596, *in Schimper* n. 1124.

Species polymorpha vel composita, per regiones calidiores Orbis Veteris late vulgata.

α. typica (Rottb. Descr. et Ic. t. 4. fig. 2). Culmi cæspitosi, 2–4 dm. longi, sursum trigoni. Radix perennis, valida fibrosa nigrescens, haud raro breviter rhizomatosa, lignescens, interdum (Heyne in Wallich h. n. 3433) longe repens, tenuis, lignosa, stolonibus longis nigris tenuibus squamosis additis. Folia plura longa, plana, in marginibus scabra, culmum sæpe superantia. Involucri bracteæ 3–12, umbellam longe superantia. Umbellæ radii 5–14, usque ad 5 cm. longi. Spicæ longæ 10–15 mm., latæ 7–8 mm., cylindricæ, densissimæ, 40–60-spiculosæ. Spiculæ longæ 4 mm., latæ 1 mm., oblique lanceolatæ, 4-glumæ; glumæ 2 imæ parvæ, vacuæ; tertia hermaphrodita, quarta vacua (vel rarius mascula) tertiam non (aut vix) superans. Gluma fertilis ovata, subobtusa, 3-nervia, multistriata, viridis, fusco-spadiceo-maculata. Stamina 3; filamenta angusta, levia; antheræ lineari-oblongæ, muticæ vix apicatæ. Stylus nuce multo brevior; rami 3, e gluma breviter (ccnspicue) exserti. Nux cum $\frac{2}{3}$–$\frac{3}{4}$ parte glumæ æquilonga, late oblonga vel subellipsoidea, utrinque brevissime angustata, trigona; cellulæ extimæ quadratæ, persistentes.

Per Indiam orientalem vulgaris: Dehra Doon (*G. King, h. Calcutta*); Madras (*Wallich* n. 3434, *h. Calcutta*); &c.

In these typical forms the 3rd glume is ovate hermaphrodite, the 4th ligulate barren shorter than the 3rd, cutting away the distinction given by Bentham to separate *Kyllinga* from *Cyperus* (sect. *Mariscus*). But from this typical form there are gradations (by me indefinable) which carry us into the forms *cylindrostachys*, *cyperina*; in short, into all the other varieties.

We have, first, examples in which the upper (4th) glume is a little longer than the 3rd, then usually male; after these come examples with the 4th glume $\frac{2}{3}$ the length of the 3rd, often hermaphrodite (rarely perfecting a nut), and a fifth glume is present.

The spicula becomes more slender, or finally acicular, and we arrive at forms named by some cyperologists *C. cylindrostachys*, by others *C. cyperinus*.

Among the great diversity of forms I do not find one that seems to me to be conspecific with *C. ovularis*, Torrey; and that is Mr. Bentham's opinion.

Var. *β. panicea*; spicis parvis subsessilibus; spiculis parvis, anguste oblique lanceolatis, gluma mascula hermaphroditam parum superans.

C. paniceus, *Boeck. in Linnæa*, xxxvi. p. 361.

Kyllinga panicea, *Rottb. Descr. et Ic.* p. 15, t. 4. fig. 1, *non* Mariscus paniceus, *Kunth.*

Zeylania (*Thwaites* n. 2878, *h. Calcutta*).

Madras Peninsula (*Heyne in Wallich* nn. 3435, 3436, *h. Calcutta*); Palaverum Hill (*Wight in Wallich* n. 3435, *h. Calcutta*).

Var. *γ. picta*, Wallich MS.; spicis fere sessilibus subglobosis, albidis aut glauco-purpurascentibus; spiculis late oblongis, gluma mascula quam hermaphrodita vix longiore.

Mariscus Wallichianus? *Kunth, Enum.* ii. p. 117.

Tranquebar (*Rottler* n. 648, *h. Calcutta*).

Ins. Nicobar (*Kurz, h. Calcutta*).

Var. *δ. laxata*; rhizomate elongato, ramoso, tenui; culmis elongatis, tenuibus, flaccidis; spicis breviter pedunculatis, laxis, ovoideis, 1–5-spiculosis; spiculis anguste lanceolatis, gluma hermaphrodita quam spicula multo breviore.

Zeylania (*Thwaites C. P.* n. 817, *h. Calcutta*).

Madras Peninsula (*Heyne, h. Calcutta*).

Var. *ε. cylindrostachys*; spicis elongatis cylindraceis, sæpe longius pedunculatis, undique patentim vel subdeflexim dense spiculigeris; spiculis anguste lineari-lanceolatis; gluma hermaphrodita tertia quam superiores vix breviore aut multo breviore.

Bengalia orientalis (*Griffith* n. 6242, *h. Kew*).

Nepaul (*Wallich* n. 3437 *a*, *h. Calcutta*).

Tenasserim v. Andamans (*Helfer* n. 6243 | 1, *h. Calcutta*).

Borneo (*Barber, h. Calcutta*).

This variety is defined only by the inflorescence: the structure of the spikelets varies from that in *C. umbellatus* type very nearly to that in *C. biglumis*: the spikelets vary in length from 2 to 6 millim. Those examples in which the 4th (and 5th) glumes much overtop the 3rd are named *C. cyperinus* &c.

DESCRIPTIO TABULARUM.

Tab. I.

Fig. 1. *Cyperus cephalotes*, Vahl. Pistillum juvene.
2. —— ——. Pistillum paullo maturius.
3. —— ——. Nux, cum 3 staminibus, a facie visa.
4. —— ——. Hujus sectio transversalis per basin nucis.
5. —— ——. Hujus sectio transversalis per basin pedicelli.
6. —— ——. Nux a dorso visa.
7. —— *platystylis*, R. Br. Nux, cum 3 staminibus, a facie visa.
8. —— ——. Nux a dorso visa.
9. —— ——. Hujus sectio transversalis per basin nucis.

Tab. II.

Fig. 10 & 10 *a*. *Cyperus pygmæus*, Rottb. Nux, cum sectione transversali.
11 & 11 *a*. *Isolepis Micheliana*, Roem. et Sch. Nux, cum sectione transversali.
12. *Cyperus alopecuroides*, Rottb. Nux, cum sectione transversali. Spiculæ rhachilla ampliata.
13. —— *dives*, Delile. Nux, cum sectione transversali. Spiculæ rhachilla ampliata.
14. —— *longus*, Linn. Rhizoma (squamis amotis).
15. —— *esculentus*, Linn. Ditto.
16. —— *rotundus*, Linn. Ditto.
17, 18. —— *jeminicus*, Rottb. Ditto.
19. —— *tegetum*, Roxb. Ditto.

Tab. III.

Fig. 20, 21. *Cyperus lævigatus*, Linn. Rhizoma (squamis amotis).
22. —— *scariosus*, R. Br. Ditto.
23, 24. —— *Haspan*, Linn. Ditto.
25. —— *flavidus*, Retz. Ditto.
26. —— *filicinus*, Vahl. Umbellæ radius unicus.
27. —— *polystachyus*, Rottb. Ditto.
28. —— *lucidulus*, Klein. Spiculæ rhachilla.
29. —— *Monti*, Linn. Ditto.

Tab. IV.

Fig. 30. *Cyperus puncticulatus*, Vahl. Spiculæ rhachilla.
31. —— *auricomus*, Sieber. Spiculæ rhachilla.
32. —— *platyphyllus*, Roem. et Sch. Anthera.
33. —— *lævigatus*, Linn. Ditto.
34. —— *Haspan*, Linn. Ditto.
35–39. *Cyperi* sp. Nucis superficies ampliata.
41. *Cyperus flavescens*, Linn. Nux.
40. —— ——. Hujus superficies magis ampliata.
42, 44. *Pycrei* sp. Nux, cum sectione transversali.
43. *Juncelli* sp. Ditto.

Contributions to the Flora of North Patagonia and the adjoining Territory. By JOHN BALL, F.R.S., M.R.I.A., F.L.S., &c.

[Read February 21, 1884.]

I RETURNED last year from Brazil to England in company with M. Georges Claraz, a Swiss gentleman who had passed several years in the Argentine territory, chiefly at Bahia Blanca, and who during his residence at that place made frequent excursions through Northern Patagonia as far as the river Chubat, and even beyond that river. Having a fairly extensive knowledge of the principles of physics and biology, and being gifted with keen and accurate powers of observation, M. Claraz has accumulated a large store of valuable information respecting a region still very imperfectly known, which will, I trust, be soon given to the world. Along with collections in other branches of natural history, M. Claraz preserved specimens of most of the plants observed during his residence in South America. The greater part of these were sent some years ago to Switzerland, but have unfortunately been lost or mislaid. He retained a smaller collection, chiefly from the neighbourhood of Bahia Blanca and the adjoining territory of North Patagonia, which he was good enough to send to me after his return to Europe. It included about 190 species from the Patagonian region, and a much smaller set of about 60 species from the province of Entrerios. The interest of the collection is much enhanced by the notes added by M. Claraz respecting many of the species, their properties and uses, with the vernacular names of those familiar to the Indian tribes.

It is well known that the coast-region of North Patagonia was visited by Charles Darwin in 1833. He collected a good many plants, chiefly near Bahia Blanca, specimens of which are preserved in the Kew Herbarium, and has left an admirable description of the prominent physical characteristics of the Patagonian region. But neither Darwin nor any of the botanists who have since been able to visit the country have been able to penetrate far into the interior, or to remain long enough to acquire any but a very partial acquaintance with the flora. This is evidenced by the very meagre account of the vegetation given in Grisebach's great work on the Vegetation of the Earth, and by the fact that in the very useful volume on the Argentine Republic, edited by Mr. R. Napp, the late Professor Lorentz, in the chapter treating of the Vegetation of the Argentine territory, was forced, when attempting to give an account of the Patagonian flora, to rely altogether upon information supplied by two settlers, MM. Heusser and Claraz, who were not botanists, and were therefore unable to identify with species known to science most of the plants referred to by them under local names.

I have therefore thought it desirable to prepare a list of the species received from M. Claraz, as a contribution to the existing scanty materials towards a knowledge of the Patagonian flora, adding a few preliminary remarks on its general characteristics.

The political boundaries of Patagonia have been altered at various times; but we may safely assign as its natural physical limit to the north the valley of the Rio Colorado, which reaches the Atlantic about fifty miles south of Bahia Blanca. In his phyto-geographical map of the Argentine territory, Prof. Lorentz included a tract north of that river extending to the Sauce, whose estuary forms the port of Bahia Blanca; while for political purposes a considerable part of the country lying between the rivers Colorado and Negro has been annexed to the province of Buenos Ayres. Three considerable rivers carry the drainage of the Cordillera to the Atlantic across Patagonia, but receive only few and inconsiderable affluents—the Rio Colorado, forming the northern boundary, flowing S.E. and having its mouth about 40° S. lat.; the Rio Negro, uniting two considerable branches which between them drain the eastern face of the Araucanian Cordillera for a distance of fully 200 miles, and flowing E.S.E. into the Atlantic about 41° S.; and the Chubat, flowing a little S. of E. to its mouth about 43½° S. The Chubat may be looked upon as the boundary between North and South Patagonia, dividing it into two territories of nearly equal extent. Of these the northern has been partially, though imperfectly, explored; and annually receives a gradually increasing number of European colonists; while Southern Patagonia, in spite of the remarkable journey of Lieutenant Musters, continues to be one of the least-known portions of the earth, and, excluding the northern shores of the Magellan Strait which are subject to quite different physical conditions, contains in a territory as large as Spain but one petty trading-port—that of Santa Cruz, about lat. 50° S.; while the indigenous Indian population, estimated by Musters at 3000, is believed to be now reduced to less than half that number. Speaking in general terms, Patagonia may be said to consist of a plateau region extending from the base of the Cordillera to the Atlantic coast, the whole of which has been upraised within a very recent geological period, and in which the rivers and minor streams have excavated valleys varying much in depth and breadth. The most remarkable feature in the flora of this region is its extreme poverty. Its components include the plants growing on the dry stony plateaux and those of the comparatively moist and sheltered valleys; but, putting together all that has been collected and published in Europe, I doubt whether more than 300 indigenous species can be said to be certainly known to grow south of the Rio Colorado. No doubt this number will be largely increased whenever naturalists are able to reach the country at the eastern base of the Cordillera, where Lt. Musters observed many plants not seen by him elsewhere. With regard, however, to the region now comparatively known, it is certain that the extreme poverty of the flora of such an extensive continental area is a fact quite exceptional. If this be true as to North Patagonia, the case is much stronger as to the southern part of the territory. In the neighbourhood of Santa Cruz Dr. C. Berg was able to collect only 60 species, including in that number a few Cryptogams; and he notes the rarity of grasses in that district, while in M. Claraz's collection I find 24 species of indigenous grasses, besides 6 others, probably introduced by man.

The causes of the poverty of the Patagonian flora do not seem to me to have been adequately explained. Prof. Lorentz * is disposed to attach most importance to the uniformity and sterility of the soil and the rudeness of the climate. The soil of the plateau is no doubt both very uniform and very sterile, but similar tracts in other parts of the world support a very varied vegetation, and Engler has assigned good reasons for believing that dry soils are in general favourable to the development of new vegetable forms. Further, it may be remarked that the soil of the valleys must exhibit a sufficient degree of variety of moisture, of constituents, and of exposition to favour the development of many species not yet established there.

Still less can I admit the severity of the climate as an explanation of the poverty of the flora. So far as I know, we have no continuous observations from any place in Patagonia proper; but we cannot suppose the climate of the northern districts to

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* See 'The Argentine Republic,' by Richard Napp (Buenos Ayres, 1876), Chapter vii. by the late Prof. Lorentz.

differ much from that of Bahia Blanca, where we find the following temperatures as the result of 20 years' observations :—

Three summer months …………	75°·6 Fahr.
Three winter months …………	46·2 „
Mean of the year ………………	59·4 „

This at once shows that the climate is eminently of a temperate character; and this conclusion is fortified by the fact that in 20 years the mean maximum temperature of the year was 100°·7 F.* and the mean minimum 26°·8 F. A very similar climate is to be found in Europe in the corresponding latitude about 100 miles east from the coast of Portugal towards the Spanish frontier. If further proof were requisite, it is to be found in the fact that wheat is very productive, and the vine thrives in the valley of the Rio Negro. As already remarked, the dryness of the climate does not account for the poverty of the flora. As is well known, the opposite coasts of extratropical South America present exactly opposite conditions as regards the distribution of moisture. In travelling southwards on the west coast you pass from the rainless zone of Peru and the extreme dryness of Northern Chili to the climate of Central Chili, where at Valparaiso the annual rainfall is only 13·6 inches, yet supports a varied flora, including a good many indigenous trees whose structure has been adapted to the climatic conditions. The rainfall increases very rapidly along the southern coast of Chili till it reaches a maximum, probably about 42° S. lat., of from 130 to 140 inches a year.

On the Atlantic coast you find in South Brazil, about 26° S. lat., an annual rainfall of about 90 inches, which at Monte Video is already reduced to about one half, and at Buenos Ayres, less exposed to the direct influence of the Atlantic, is not more than 35 inches. But this, it will be remarked, is nearly three times the fall at Valparaiso, in the same latitude, on the west coast. At the hilly station of Tandil, not far from the sea, though further south by three degrees, the rainfall is the same as at Buenos Ayres; but at Bahia Blanca we find only a fraction less than 20 inches, and Dr. Hann gives a return for one year from the banks of the Chubat showing a rainfall of 17 inches. There is a further point to be noted—that on the west coast the rainfall is almost exclusively confined to winter, whereas in Patagonia it is spread pretty uniformly over the seven warmer months of the year from October to April, not more than five inches falling in the five colder months, from May to September, a condition evidently favourable to tree-vegetation.

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* The comparatively high maximum temperature given for Bahia Blanca may depend on local causes or some defect in the protection of the thermometer from radiation. At Buenos Ayres, more than 4° nearer the equator, the mean yearly maximum is 94° F.

The true explanation, in my opinion, of the exceptional poverty of the Patagonian flora is to be sought in the direction long ago indicated by Charles Darwin, when, in discussing the absence of tree-vegetation from the pampas, he remarks that in that region, recently raised from the sea, trees are absent, not because they cannot grow and thrive, but because the only country from which they could have been derived—tropical and subtropical South America—could not supply species organized to suit the soil and climate. So it happened in Patagonia—raised from the sea during the latest geological period, and bounded to the west by a great mountain-range mainly clothed with an Alpine flora requiring the protection of snow in winter, and to the north by a warm temperate region whose flora is mainly of modified subtropical origin—the only plants that could occupy the newly formed region were the comparatively few species which, though developed under very different conditions, were sufficiently tolerant of change to adapt themselves to the new environment. The flora is poor, not because the land cannot support a richer one, but because the only regions from which a large population could be derived are inhabited by races unfit for emigration. The rapidity with which many introduced species have spread in this part of South America is perhaps to be accounted for less by any special fitness of the immigrant species, than by the fact that the ground is to a great extent unoccupied. Doubtless, if no such interference had taken place, and the operation were left to the slow action of natural causes, a gradual increase in the vegetable population would come about. Fresh species of Andean plants would gradually become modified to suit the climate of the plain (perhaps one such recent instance is supplied in *Boopis laciniata* of the following list); still more slowly new varieties would have been developed among the indigenous plants, from which, by natural selection, new species would have been formed. No doubt these causes have been in action during the short time that has elapsed since Patagonia has existed as part of the continent; but the time has been far too short to allow of the development of a rich and varied flora. We are apt, I think, to underrate the extreme slowness of the operation of the agencies that modify the forms of vegetation and the fact that change in arboreal vegetation must, other things being the same, proceed much more slowly than with herbaceous, especially annual, plants. How many of the plants found in fossil Miocene deposits, enormously more ancient than the commencement of the Patagonian flora, are more than slightly modified forms of existing species?

Although the collection at my disposal gives a very incomplete view of the flora of North Patagonia, there may be a little interest in comparing the proportion borne by the chief natural orders to the whole known flora in this as compared with the flora of the Argentine region as made known by Grisebach's 'Symbolæ.'

Table showing the Proportional Number of Species belonging to the chief Natural Orders in the North-Patagonian and Argentine Floras.

Natural Orders.	North Patagonia.		Argentine.	
	No. of species.	Percent. on whole flora.	No. of species.	Percent. on whole flora.
Cruciferæ	4	2·0	21	0·9
Caryophylleæ	3	1·5	30	1·35
Malvaceæ	0	0	51	2·25
Geraniaceæ	5	2·6	31	1·4
Leguminosæ	8	4·1	174	7·7
Rosaceæ	7	3·6	14	0·6
Lythrarieæ	1	0·5	25	1·1
Loasaceæ	4	2·0	11	0·5
Umbelliferæ	4	2·0	38	1·7
Rubiaceæ	1	6·5	39	1·7
Compositæ	36	18·65	377	16·6
Asclepiadeæ	1	0·5	38	1·7
Convolvulaceæ	0	0	44	1·9
Solanaceæ	9	4·6	95	4·2
Scrophularineæ	5	2·6	33	1·5
Labiatæ	1	0·5	33	1·5
Verbenaceæ	7	3·6	43	1·9
Amarantaceæ	7	3·6	37	1·65
Chenopodiaceæ	8	4·1	19	0·84
Polygonaceæ	5	2·6	19	0·84
Euphorbiaceæ	0	0	76	3·4
Urticaceæ	1	0·5	22	1·0
Irideæ	2	1·0	22	1·0
Liliaceæ	1	0·5	26	1·15
Cyperaceæ	5	2·6	66	2·9
Gramineæ	30	15·5	187	8·25
Filices	6	3·1	66	2·9

The latter naturally includes a large proportion of species belonging to subtropical types. Both lists include the introduced as well as the indigenous species.

Seven species enumerated in the following list, but which probably do not extend to Patagonia, are excluded from this table.

The most noticeable features in the comparison are the much larger proportion of Rosaceæ and Gramineæ in the Patagonian flora, with relatively few Leguminosæ, and a complete absence of Malvaceæ, Convolvulaceæ, and Euphorbiaceæ, of which orders the Argentine flora contains 171 species, or more than 7½ per cent. Besides the above, the Argentine flora, as might be expected, includes representatives of numerous natural orders (with about 400 species) not yet known to be represented in Patagonia.

The small collection of plants from Entrerios sent to me by M. Claraz contains only about 60 species, several of which are imperfect fragments, and of course cannot be considered as representative of the comparatively rich and moderately well-known flora of that region. Nevertheless, I find the following eight species not enumerated by Grisebach from that province, and only two of which he appears to have received from any part of the Argentine territory:—

Pavonia glechomoides, A. St. Hil.,=*P. cymbalaria*, DC. Concepcion del Uruguay (No. 276, G. C.).

Cassia cæspitosa, Lam. Entrerios (No. 263, G. C.).

Cuphea glutinosa, Cham. & Schlecht. Near S. José (No. 260, G. C.).

Tabernæmontana affinis, var.? Banks of the Uruguay (No. 251, G. C.).

Grisebach does not include any species of this genus.

Convolvulus dissectus, Cav., var. *angustifolia*. Forests and islands of the Uruguay (No. 287, G. C.).

Nicotiana acutifolia, A. St. Hil. Entrerios (No. 262, G. C.). Received by Grisebach from the province of Cordoba.

Nectandra amara, var. *australis*, Meisn. Entrerios (No. 247, G. C.). Received by Grisebach from Oran (the subtropical region in the extreme north of Argentine territory).

Andropogon virginicus, L. Entrerios (No. 130, G. C.).

I may here remark that many of the statements made by travellers which have been adopted in works of authority, respecting the vegetation of South America, are open to much question, and illustrate the tendency (from which even men of science are not free) to draw large inferences from a slender foundation of observed facts. What has been stated in general terms respecting the flora of Patagonia, if supposed to apply to the whole region, is much as if one should discuss and describe the flora of France who had landed at Dieppe and Nantes and Bordeaux, and travelled at each place a few miles into the interior. Thus Grisebach has borrowed from Mr. Page the statement that the plains of North Patagonia are so devoid of tree-vegetation that a single stunted tree of Acacia* near the Rio Negro is worshipped by the natives as a sacred object. But I learn from M. Claraz that groups of small trees or shrubs tall enough to conceal a man on horseback, especially those of *Iodina rhombifolia*, are dotted at rather wide intervals; while along the valleys *Salix Humboldtiana* and other small trees are not unfrequent, and in the valley of the Upper Limay the apple-tree, introduced from Europe, forms considerable groves.

Again I may remark, with reference to the valley of the Uruguay, that the assertion, also accepted by Grisebach, that the trees on the banks are all low, not exceeding 10 metres, or 33 feet, may be true at some points, but certainly not as a general statement. At many places, both along the shores and on the numerous islands, the trees range from 50 to 60 feet in height; one of these is *Luhea divaricata*, and several appear to be Leguminosæ, which, however, I was not able to approach. Again, with regard to the asserted poverty of the flora of Uruguay and Entrerios, I venture to entertain much doubt. Much of the territory of both provinces is flat and uniform in physical conditions, but about 1000 species are known from Entrerios, to which, out of a small set of 60 species, as above mentioned, 8 additions have to be made, showing how incomplete is our present knowledge. The surface and the soil of Uruguay, on the opposite bank of the same river, are much more varied, besides which there is a long stretch of sea-coast with moderately high land. If M. de St. Hilaire, while travelling in the best season, was unable to collect more than 500 species, I conclude that his itinerary was not well chosen for botanical purposes. To judge from two short excursions made in the depth of winter (end of June) from Montevideo, and from Paisandu on the Uruguay, I should have formed a very different conclusion. Near the latter place I found the open country interspersed with a considerable variety of shrubs, in great part evergreen, reminding one of the aspect of many parts of the Mediterranean region.

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* Perhaps the same spoken of by Darwin.

Lastly, with regard to the asserted paucity of subtropical forms in the regions bordering on the lower course of the Paraná and the Uruguay, it seems to me that, as compared with districts in the same latitude north of the equator, whether in North America or North Africa, the statement is quite opposed to the facts. Of the tree-vegetation nearly all are subtropical forms. Of the bushes the majority seem to belong to types characteristic of temperate South America, most of them common to the east and west sides of the Andes, while the herbaceous vegetation exhibits about an equal proportion of elements characteristic of the subtropical and the South-temperate American floras. With reference to this subject much information is to be found in a paper by Sir Charles F. Bunbury, in the 21st volume of the 'Transactions of the Linnean Society,' lately reprinted, with additions, for private circulation, along with other valuable papers by the same author.

It may be well to state that all the information contained in the following list respecting the habitats, the local names, and the uses of the plants enumerated is derived from M. Claraz. For the botanical matter alone I am responsible.

List of Plants collected in North Patagonia and South Part of the Province of Buenos Ayres by M. Georges Claraz.

The species marked with an asterisk probably do not extend to Patagonia.

BERBERIDEÆ.

BERBERIS HETEROPHYLLA, *Juss.*? A bush 4 to 5 feet high, common in Patagonia. Its northern limit is about halfway between the Rio Negro and the Chubat (No. 147, G. C.). The Struthious bird, *Rhea Darwinii*, Gould, is very fond of the berries, but these give a disagreeable taste to the flesh.

The Patagonian Indian name for the plant is *Gayaukhia*, and for the berries *Khalgo*. The specimen is a small incomplete fragment, and the determination uncertain. The plant may be undescribed.

PAPAVERACEÆ.

FUMARIA CAPREOLATA, *L.*, var. Common about Buenos Ayres and further south; doubtless introduced from Europe (No. 157, G. C.).

CRUCIFERÆ.

VESICARIA ANDICOLA, *Gill.*,=V. montevidensis, *Eichl. in Fl. Bras.* On the plateaux near Bahia Blanca and in North Patagonia (No. 132, G. C.). The name given by Gillies was changed by Eichler because the plant is mainly an inhabitant of the low country in the Argentine and Uruguay territories. But it also extends to the eastern slopes of the Andes, and mere inappropriateness, apart from positive error, is not a sufficient ground for changing an established name.

BRASSICA RAPA, *L.*, var. CAMPESTRIS, = B. campestris, *L.* Introduced from Europe, and now widely spread from the warm low regions of Entrerios to the barren banks of the Chubat in Mid-Patagonia (No. 186, G. C.). It sometimes produces tough and stringy turnips, and is very troublesome to farmers. From the Spanish name *Nabo* the Araucanian Indians have formed for the plant a native name, *Napur*.

LEPIDIUM BONARIENSE, *L.*,=L. pubescens, *Desv.* Very common throughout the province of Buenos Ayres (No. 143, G. C.). Grisebach (Pl. Lorentz. p. 25) identifies the *L. pubescens* of Desvaux with the plant generally taken by authors as *L. bonariense* of Linnæus, but impliedly holds that the plant of Linnæus is a different species. I do not know the grounds for this conclusion, and am disposed to believe that there is one somewhat variable species with a wide range from Mexico to temperate South America, which includes *L. bonariense*, L., *L. pubescens*, Desv., *L. bipinnatifidum*, Desv., and *L. Chichicara*, Desv.

LEPIDIUM? Sierra de la Ventana, near Bahia Blanca (No. 64, G. C.). Specimen too immature. Doubtless a form of *L. bonariense*, L.

POLYGALEÆ.

POLYGALA SPINESCENS, *Gill.*, var.? ASPALATHOIDES, nobis. Grows about Bahia Blanca, where it is used for making brooms (No. 134, G. C.). As this is a well-marked variety, if not a distinct species, I subjoin a brief description.

Fruticulus ramosissimus, ramis erectis, novellis herbaceis foliaceis, annotinis rigidis sublignosis aphyllis; foliis parvis, lineari-oblongis apice rotundatis, subglaberrimis; floribus in racemum laxum foliaceum dispositis, parvis lilacinis; petalis lateralibus ope tubi staminei cum carina cohærentibus. Capsulam non vidi.—*P. spinescens*, Gill. in Hook. Bot. Misc. iii. 146, differt statura minore, ramulis flexuosis, et (an semper ?) aphyllis. Species est parum cognita, cujus exemplar unicum incompletum exstat in Herbario Kewensi, a Gillies ad *Salto de las Aguas* prope Mendoza lectum.

I have not seen *Acanthocladus microphyllus*, Griseb., to which that author doubtfully refers *P. spinescens*, Gill. This appears to be a true *Polygala*.

CARYOPHYLLEÆ.

SILENE ANTIRRHINA, *L.*, var. PTERONEURA, nob. Frequent in the valleys near Bahia Blanca (No. 116, G. C.). *Silene antirrhina*, L., is widely spread throughout both North and South America. A large series of specimens in Kew Herbarium, including one gathered at Bahia Blanca by Darwin, exhibits but trifling varieties. The plant sent by M. Claraz differs remarkably in having the veins of the calyx expanded into prominent herbaceous corrugated ridges. The calyx-teeth are also longer, and the solitary capsule ovoid and not globose. Is this an instance in which a new variety has been developed within the last half-century ?

CERASTIUM SEMIDECANDRUM, *L.* Bahia Blanca, by watercourses (No. 108, G. C.).

CERASTIUM COMMERSONIANUM, *Ser.*, = C. chilense, *Baill.* Bahia Blanca, by watercourses (No. 111, G. C.). Distinguished from *C. arvense*, L., mainly by the foliaceous bracts, with the edges not scarious.

HYPERICINEÆ.

HYPERICUM CONNATUM, *Lam.* Sierra de la Ventana, and North Patagonia (No. 71, G. C.).

ZYGOPHYLLEÆ.

LARREA NITIDA, *Cav.* Valley of the Limay and elsewhere in North Patagonia (No. 87, G. C.).

GERANIACEÆ.

GERANIUM PATAGONICUM, *Hook. fil.* Common about Bahia Blanca (No. 48, G. C.). The local Spanish name for this, as well as the next very different plant, is *Alfilerillo.* To judge from a specimen in Kew Herbarium, *G. intermedium*, Bert., is not distinct from this.

ERODIUM CICUTARIUM, *L'Hér.* Widely spread from Buenos Ayres southward through Patagonia. It is called *Alfilerillo*, and is considered useful for cattle, because it springs up afresh after each fall of rain (No. 106, G. C.). This species, doubtless introduced from Europe, has spread throughout nearly the whole of South America. I have seen it in Peru from the coast up to 3700 metres in the Andes, and equally common in Chili; and Grisebach records it from all parts of the Argentine territory. Like many other introduced plants, it owes its diffusion much more to animals than to the direct agency of man.

*TROPÆOLUM PENTAPHYLLUM, *Lam.* In a wood near La Magdalena, not far from the shores of La Plata (No. 232, G. C.). This species is, I believe, common in Uruguay and Entrerios, but does not spread far southwards. It is sometimes cultivated for ornament.

OXALIS —— ? Very common at Bahia Blanca and in North Patagonia, springing up after the rains in spring and autumn, and very variable in the colour of the flowers: the form with yellow flowers (No. 57, G. C.); with violet flowers (No. 58, G. C.); with pale-blue flowers (No. 100, G. C.). This plant is called by the Spaniards *Vinagrillo*, and *Tschilki* by the Araucanian Indians, who eat the tuberous root. There is a specimen at Kew collected by Darwin at Bahia Blanca, but I cannot identify it with any of the described species. So many South-American species of this genus have been published of late years, that I think it imprudent to give a name to this. If undescribed, it may properly be named *O. Darwinii.*

OXALIS MARTIANA, *Zucc.* ? From the Isla Verde, near Bahia Blanca, and elsewhere. It is widely spread northwards to Entrerios, and southward through North Patagonia (Nos. 104 & 159, G. C.). This has tomentose leaves, blue flowers, and a tuberous root. Though very different from the last, it has the same name both among the Spaniards and Indians, and the latter also eat the roots. If the name above given is correct, this extends also to Brazil. I should be more disposed to identify it with *O. floribunda*, Lehm., but M. Claraz's specimen was named by the late Professor Lorentz.

OXALIS AMARA, *St. Hil.* Like the last species, this is widely spread from Entrerios through Buenos Ayres to North Patagonia

(No. 103, G. C.). Sometimes improperly called *Vinagrillo.* This species has not a tuberous root. My specimen is very incomplete.

CELASTRINEÆ.

MAYTENUS CHILENSIS, *DC.* Valleys of the Upper Limay and Chubat, in Patagonia (No. 59, G. C.). A small tree, rather variable in habit.

RHAMNEÆ.

DISCARIA LONGISPINA, *Hook. & Arn.* Common in the west and south of the province of Buenos Ayres (No. 83, G. C.). The thick roots serve as fuel, and the flowers are sold in Buenos Ayres. Further south, in Patagonia, the flowers of this (perhaps a different?) species give out an odious smell. *D. febrifuga*, Mart., is scarcely a distinct species.

ANACARDIACEÆ.

DUVAUA PRÆCOX, *Griseb.* A common and characteristic shrub throughout North Patagonia (four specimens, Nos. 150–153, G. C.). This forms a bush 5 or 6 feet in height. The Patagonian Indians call the plant *Rerèle* and the fruit *Yssgitz.* The Araucanian name is *Mitschi.* There is another species, called *Ahnec* by the Patagonians, a small tree, not more than 15 feet in height, with broader leaves and larger fruits, from which the Indians prepare a fermented drink. *D. præcox* appears to be widely spread and very variable; I do not think that *D. fasciculata*, Griseb., can be separated from it.

LEGUMINOSÆ.

MEDICAGO LUPULINA, *L.*? Very young, but undoubted. Bahia Blanca (No. 105, G. C.). Introduced from Europe with other species of the same genus.

GLYCYRRHIZA ASTRAGALINA, *Hook. & Arn.* Appears to have descended from the Cordillera along the valleys of the Chubat, Rio Negro, and Rio Colorado (No. 162, G. C.). This, which has blue flowers and glutinous leaves, flowers in spring (October to December). The Spanish name is *Curuzu*; the Araucanian name *Milpi.* A decoction of the resinous leaves is administered to women after childbirth.

ADESMIA GRISEA, *Hook. fil.* Bahia Blanca and south of the province of Buenos Ayres. Common, especially in sandy ground

(No. 109, G. C.). *A. incana*, Vogel, seems to be too near to this species.

ADESMIA PENDULA, *DC.* Bahia Blanca; Cabo S. Antonio; North Patagonia (No. 228, G. C.). This is a yellow-flowered species. The specimen represents a small form.

ADESMIA ——? Bahia Blanca (No. 110, G. C.). The specimen is too imperfect for determination, but is apparently the same as an unnamed specimen in Kew Herbarium from Maldonado, collected by Lieut. Carr.

ADESMIA ——? Valley of the Rio Colorado. Collected in March (No. 206, G. C.). The specimen (wanting leaves and fruit) is too imperfect for determination, but appears to be near *A. longipes*.

*ERVUM HIRSUTUM, *L.* In a wood at Ajó (No. 169, G. C.). Doubtless introduced from Europe. Not mentioned by C. Berg in his 'Enumeracion de las Plantas Europeas que se hallan como silvestres en la provincia de Buenos Ayres y en Patagonia.'

RHYNCOSIA SENNA, *Gill.*, var. *foliolis lanceolatis* Sierra de la Ventana, near Bahia Blanca (No. 80, G. C.).

RHYNCOSIA SENNA, *Gill.*, var. *foliolis late ovatis.* Bahia Blanca (No. 189, G. C.). This species, originally described from Chilian specimens, appears to be widely spread from Texas and Mexico to the borders of Patagonia. I do not think that *R. texana*, Torr. & Gr., can be separated from it. It is an insignificant climber, with small yellowish flowers.

ROSACEÆ.

MARGYRICARPUS SETOSUS, *Ruiz & Pav.* Bahia Blanca (No. 66, G. C.). Called by the Spaniards "Yerba de la perdiz," which is merely a translation of the Araucanian name *Silio lahuen*, *Silio* meaning partridge, and *lahuen* remedy. The Tinamous (*Nothura maculosa*, Temm.), or so-called partridges, of South America, are used to eat the fruit. This species was collected at Bahia Blanca by Darwin.

MARGYRICARPUS ——? Sierra de la Ventana and North Patagonia (No. 67, G. C.). This is probably a variety of *M. setosus*, but is prostrate and much more robust, bearing to it much the same relation that *Juniperus nana* does to slender forms of *Juniperus communis.*

MARGYRICARPUS —— ? Valley of the Upper Limay and elsewhere in North Patagonia (No. 65, G. C.). This is too imperfect for description; evidently allied to *M. setosus*, but the leaves are different. The rhachis is tomentose, rigid, subspinescent, and the leaflets shorter and more equal in size. It is probably *M. microphyllus* of Niederlein, who has described several new Patagonian plants in the 'Monatschrift zur Beförderung des Gartenbaus in den Preussischen Staaten' for 1881.

MARGYRICARPUS CLARAZII, n. sp. A native of Middle Patagonia, extending from about lat. 41° S. to the Chubat, and southward from that river (No. 155, G. C.). This is a small plant allied to *M. alatus*, Gill. in Hook. Miscell. iii. p. 385, but certainly distinct. I subjoin brief diagnostic characters.

A *M. alato*, Gill., differt foliolis subtus lanatis, stipulis (basi petioli adnatis) fimbriato-ciliatis, calyce florifero sericeo-piloso, fructifero in alas duas acutas expanso tuberculis acutis 2–3 intermediis minuto. The fruit in this plant is very singular. In *M. alatus* we find 4 or 5 membranous wings, recalling the appearance of the fruit of *Laserpitium*. In this the two rigid, pointed, wing-shaped expansions are as long as twice the diameter of the fruit, and the stiff, pointed, intermediate tubercles are more than half that diameter in length.

ACÆNA SPLENDENS, *Hook. & Arn.* Upper Limay, North Patagonia (No. 90, G. C.). Apparently brought down by the streams from the Andes.

ACÆNA MYRIOPHYLLA, *Lindl.* Bahia Blanca, especially common about the *bizcacheros*, or bizcacha* warrens (No. 95, G. C.).

PYRUS MALUS, *L.*, var. Valley of the Upper Limay (No. 54, G. C.). The apple is said to have been introduced into this region by the Spanish missionaries. It has thriven wonderfully, and in the interior, especially between 40° S. and 40° 30', it forms extensive groves and even small forests. It has developed two varieties; the fruit of one is sweet, of the other somewhat tart, but not uneatable. My specimen has the leaves duplicato-serrate, velvety on the under surface.

SAXIFRAGEÆ.

RIBES MAGELLANICUM, *Poir.* Valley of the Upper Limay (No. 91, G. C.). I have seen no specimens from so northern a locality.

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* The "Viscacha," *Lagostomus trichodactylus*, Brookes, of zoologists.

CRASSULACEÆ.

TILLÆA MUSCOSA, *L.*, var.,=T. minima, *Miers.* South of province of Buenos Ayres and North Patagonia (No. 156, G. C.). This was gathered by Darwin at Bahia Blanca.

HALORAGEÆ.

MYRIOPHYLLUM ——? Streams at Bahia Blanca (No. 123, G. C.). This has neither flower nor fruit, but is almost certainly *M. proserpinacoides.* It also grows in Entrerios (No. 122, G. C.).

LYTHRARIEÆ.

CUPHEA SPICATA, *Cav.*, var. RACEMOSA, *Koehne*? Marshes of the Naporta Chico, Bahia Blanca (No. 117, G. C.). I do not feel certain of the identity of this with the Uruguay plant of Koehne, but it is certainly very near to *C. spicata.*

ONAGRARIEÆ.

ŒNOTHERA MENDOCINENSIS, *Gill.* Bahia Blanca and North Patagonia (No. 137, G. C.). It is called *Balsamo* by the Spaniards, and by the Indians *Inulei,* and is used for application to wounds. This, which was collected by Darwin in Patagonia, differs from *Œ. odorata,* Jacq., in being altogether more glabrous, and having the leaves more attenuated at the base, but I doubt whether it should be ranked as more than a variety of that species. It is doubtful whether *Œ. mollissima,* L., should not be included under the same specific type.

LOASACEÆ.

MENTZELIA ALBESCENS, *Griseb.*, = Bartonia albescens, *Gill.* North Patagonia (No. 92, G. C.). This species is widely spread throughout temperate South America.

LOASA PROSTRATA, *Gill.*? Sierra de la Ventana, near Bahia Blanca (Nos. 61 & 107, G. C.). I am somewhat doubtful as to this. The species of *Loasa* are very variable, and their limits ill-defined.

BLUMENBACHIA MULTIFIDA,=Loasa multifida, *C. Gay.* In woods at Ajó, near Cabo S. Antonio (No. 167, G. C.). Called *Amor seco* by the Spaniards.

GRAMMATOCARPUS VOLUBILIS, *Presl.* Bahia Blanca and North Patagonia (No. 176, G. C.). Araucanian name *Fuéo.* Gathered by Darwin at Bahia Blanca.

FICOIDEÆ.

SESUVIUM PORTULACASTRUM, *L.* Salt-marshes of the Rio Colorado (No. 182, G. C.). Called by the natives *Gume* or *Jume*, but that is a general name for succulent herbaceous plants.

UMBELLIFERÆ.

AZORELLA GLEBARIA ?, =Bolax glebaria, *D'Urv.* Mid-Patagonia, northern limit about lat. 41° S., and extending southward beyond the river Chubat (No. 149, G. C.). I have but three minute fragments (flowering rosettes) of this plant, each about the size of a pea, but I feel sure that they belong to *A. glebaria* or a near ally. The Indian names for the plant are *Kethála* and *Gethenn*. They use the resinous root as a masticatory, and also roast and grind it into a sort of flour.

ERYNGIUM PANICULATUM, *Lam.* Bahia Blanca, thence extending northward through Buenos Ayres and Entrerios (No. 85, G. C.). This, as well as two other large *Eryngia* of similar habit, is called *Shetá* by the Araucanians. It is much less common than it formerly was. It seems as though it were driven out by the European thistles.

ERYNGIUM —— ? Bahia Blanca (No. 50, G. C.) ; Entrerios (No. 52, G. C.). The specimens are too immature for determination. They agree best with the Chilian *E. humifusum*. The plant is sometimes used for dyeing wool; and M. Claraz thinks that it may have been introduced. But it has, as he says, an Indian name, *Lief huintschu*.

APIUM RANUNCULIFOLIUM, *DC.* Bahia Blanca and North Patagonia (No. 236, G. C.). Called by the Spaniards *Apio a Maron*. This is a wide-spread and variable species, but quite distinct from the *A. australe*, which is merely a southern form of the cosmopolitan *A. graveolens*, and which, according to M. Claraz, also grows on the coast of Patagonia.

RUBIACEÆ.

GALIUM PUSILLUM, *Endl., non Sm.* Bahia Blanca and North Patagonia (No. 115, G. C.). Called by the Indians *Relfen* or *Relvun*. The roots are used to produce a red dye for wool. This is scarcely distinct from *G. corymbosum*, Ruiz & Pav.

DIPSACEÆ.

DIPSACUS SYLVESTRIS, *L.* Naporta Grande, near Bahia Blanca (No. 39, G. C.). Introduced from Europe, and has now spread widely. It is found on the banks of streams in the Sierra de la Ventana and Sierra de Tandil, in the valleys of the Rio Negro and Rio Colorado, and as far as Valcheta in Patagonia. Called by the Spaniards *Cardo de la Sierra.* This is an instance of an introduced plant extending its area very rapidly. It appears to be of very recent introduction, and is not mentioned by Grisebach or by Berg.

CALYCEREÆ.

BOOPIS ANTHEMOIDES, *Juss.* Bahia Blanca and adjoining country (Nos. 114 & 140, G. C.).

BOOPIS LACINIATA, =Nastanthus laciniatus, *Miers.* Grows on the gravelly bed of the Rio Negro, and the Chubat in Patagonia (No. 93, G. C.). This belongs to a group of species hitherto seen only in the higher regions of the Andes, and has doubtless been carried down to the plain by the streams from the Southern Andes. It is, perhaps, a variety of *B. scapigera*, Remy.

COMPOSITÆ.

STEVIA SATUREIÆFOLIA, *Sch. Bip.*, var. **ANGUSTIFOLIA**, *Baker.* Isla Verde, south of Bahia Blanca (No. 187, G. C.). Flowers rose-coloured.

STEVIA SATUREIÆFOLIA, var. **PATAGONICA** ? Sierra de la Ventana, Sierra de Tandil, Bahia Blanca, and throughout North Patagonia (No. 188, G. C.). Flowers red. I suppose this to be one of the forms of this very variable species. It approaches the variety *laxa.*

EUPATORIUM ERODIIFOLIUM, *DC.* Sierra de la Ventana and North Patagonia (No. 79, G. C.). This species has been hitherto known only from South Brazil and Uruguay. The Araucanian Indians call the plant *Meñuèké*, and use the decoction as a sudorific.

MIKANIA —— ? Grows in the water of the Naporta, near Bahia Blanca, climbing up the stems of reeds (No. 73, G. C.). This is a small plant, with leaves sinuato-lobate, the lobes rounded obtuse, the stem thin and feeble, the flower-heads small and congested. It is either an undescribed species or an extreme form of the very variable *M. scandens*, L.

GUTIERREZIA LINEARIFOLIA, *Hook. & Arn.* North Patagonia (No. 193, G. C.).

HYSTERIONICA JASONIOIDES, *Willd.* Bahia Blanca (No. 96, G. C.).

SOLIDAGO LINEARIFOLIA, *DC.* Widely spread about Bahia Blanca (No. 136, G. C.). The Indians call the plant *Felel*, and use it for dyeing wool yellow. This and *S. microglossa*, DC., seem to be forms of the same species.

ERIGERON BONARIENSE, *L.* Valley of the Rio Colorado and North Patagonia (No. 191, G. C.). The Spanish name given to this and several other Composites of similar appearance is *Chileca*; the Araucanians call it *Sassiñ*.

BACCHARIS ARTEMISIOIDES, *Hook. & Arn.* Common in North Patagonia, on the plateaux and the flanks of the valleys (No. 94, G. C.).

BACCHARIS CORIDIFOLIA, *Pers.* Sierra de Tandil, flowering in (March) autumn (No. 121, G. C.). Spanish name *Romerillo.* Widely spread, especially in Uruguay, and said to be very poisonous to cattle.

BACCHARIS GILLIESII, *A. Gr. Proc. Am. Ac.*, V. 123; var. *foliis longioribus profundius dentatis.* Sand-hills near the sea, at Isla Verde, the mouth of the Rio Colorado, and elsewhere in Patagonia (No. 181, G. C.). This is used to make brooms, and called in Spanish *Iscoba*.

BACCHARIS SALICIFOLIA, *Pers.* Sandy ground in the valleys of the Rio Negro, Rio Colorado, and the Chubat (No. 203, G. C.). A shrub 7–9 feet high; the leaves somewhat resinous and aromatic; the wood spongy, used by the Indians to make fire by friction. The limits of the South-American species of *Baccharis* are not easily defined; and this with *B. glutinosa* and their allies form a group which is widely spread through temperate and subtropical S. America.

BACCHARIS TENELLA, *Hook. & Arn.*? Plateaux of North Patagonia (No. 210, G. C.). A very imperfect fragment, and the determination uncertain.

BACCHARIS —— ? Bahia Blanca, Sierra de la Ventana, and elsewhere (No. 200, G. C.). A small fragment, too imperfect to be named.

ACHYROCLINE SATUREIOIDES, *DC.* Sierra de Tandil; flowering in autumn, end of March (No. 120, G. C.). It is somewhat remarkable to find this species, widely spread throughout tropical South America, extending so far south under very different climatal conditions. Neither from dried specimens nor from the description (DC. Prod. vi. p. 220) can I see any note of distinction between this and *A. flaccida,* DC.

GNAPHALIUM LUTEO-ALBUM, *L.* Bahia Blanca and North Patagonia (No. 63, G. C.). It is rather remarkable that this cosmopolitan weed, which is found almost everywhere else in South America, is not mentioned in Grisebach's enumeration of the very full collections made by the late Prof. Lorentz and others in the Argentine territory. It is not included by Berg in his list of plants introduced about Buenos Ayres, perhaps because he considered it indigenous.

GNAPHALIUM AMERICANUM, *Mill.*, = G. spicatum, *Lam.* About Ajó (No. 168, G. C.).

AMBROSIA ARTEMISIÆFOLIA, *L.*; var. *foliorum segmentis angustis lanceolato-linearibus.* Common at Ajó, and extends throughout the province of Buenos Ayres (No. 173, G. C.). This plant is said to give a disagreeable taste to the flesh of cattle feeding on it. It has no Indian name. Perhaps an introduced species.

XANTHIUM AMBROSIOIDES, *Hook. & Arn.* South of the province of Buenos Ayres, very common about the *bizcacheros* (No. 53, G. C.). Unlike the other *Xanthia,* this very distinct species is confined to temperate South America; but its area appears to be extending, it being doubtless transported by animals, to whose hair or fur the fruit adheres. M. Claraz informs me that in his district the plant has been seen only of late years, and was not found anywhere in that region by Professor Lorentz in his earlier excursions to the south of Buenos Ayres.

VERBESINA AUSTRALIS, *Baker,* =Ximenesia microptera, *DC.* Bahia Blanca. A weed which seems to follow the colonists (No. 43, G. C.).

SPILANTHES HELENIODES, *Hook. & Arn.* From Bahia Blanca westward and southward through Patagonia (No. 97, G. C.). The Indians call this plant *Ñim ñim*, and chew the root to allay thirst. A decoction is also used with a compress for headache. M. Claraz's specimen is named *Gaillardia Doniana* on the authority of Lorentz; but there must be some mistake, as that is a very different plant.

*BIDENS CHRYSANTHEMOIDES, *Michx.* About Cabo S. Antonio, in inhabited places (No. 195, G. C.). Probably spread by the agency of man. *B. helenioides*, H. B. K., seems to be a form of the same species.

FLAVERIA CONTRAYERVA, *Pers.* Bahia Blanca (No. 51, G. C.). Perhaps an introduced plant; but its use as a yellow dye is known to the Indians.

TAGETES ——? Bahia Blanca (No. 220, G. C.). An imperfect specimen which I have been unable to make out. Even the genus is uncertain.

GAILLARDIA MEGAPOTAMICA, *Spreng.*, var. SCABIOSOIDES, *Baker*, =Cercostylos scabiosoides, *Arn.* Bahia Blanca and North Patagonia (No. 75, G. C.). The Araucanian name is *Tschöike catschu*, meaning Rhea-grass. The leaves are very aromatic, and the infusion is used as a sudorific. It is an illustration of the justice of the precept of M. Alphonse de Candolle, that you should never attribute to an author a name which he has not used, to observe that this species is cited by Grisebach ('Plantæ Lorentzianæ,' p. 140, and 'Symbolæ ad floram Argentinam,' p. 199), as "*Gaillardia scabiosoides*, Benth. Hook." If the authors of the 'Genera' had undertaken to name the species, they would probably have formed the same conclusion as Mr. Baker has expressed in the 'Flora Brasiliensis.'

SENECIO PINNATUS, *Poir.* Sierra de la Ventana and North Patagonia (No. 78, G. C.). The Araucanian name is *Tschacalia.*

SENECIO PINNATUS, *Poir.*, var.? GLANDULOSUS. Bahia Blanca, and through North Patagonia (No. 98, G. C.). I am somewhat doubtful as to this being referred to a form of *S. pinnatus.* It closely resembles *S. punctatus*, Hook. & Arn., which has been by Mr. Baker united to *S. pinnatus*; but this specimen differs from all the forms of that species in the rather dense glandular pubescence of the upper ramifications and the involucres.

SENECIO LARICIFOLIUS, *H. B. K.*? A small shrub from the plateaux of North Patagonia (No. 209, G. C.). This is a poor specimen, but it agrees with one collected by Darwin near Bahia Blanca, and thus labelled in Kew Herbarium. It agrees pretty well with the description of Kunth. Nevertheless I do not feel sure of the specific identity of this and the Peruvian plant.

SENECIO —— ? Bahia Blanca (No. 205, G. C.). A very imperfect fragment, looking like *S. oligoleucos*, Baker.

CNICUS LANCEOLATUS, *L.* Introduced from Europe of late years, now widely spread in the district of Bahia Blanca. Called in Spanish *Cardo negro*.

HYALIS ARGENTEA, *Don.* Bahia Blanca and North Patagonia: one of the characteristic plants of this region (No. 164, G. C.). The Spaniards call this *Oliva* and also *Maqui blanco*. The resinous excrescences on the stem caused by insects are gathered by the Indians, and used as a masticatory.

CHUQUIRAGA ERINACEA, *Don.* Widely spread through North Patagonia from the Atlantic coast to the Cordillera, the northern limit being about Bahia Blanca (No. 82, G. C.). The Araucanian name is *Tschitri kekelu*.

CHUQUIRAGA HYSTRIX, *Don.* North Patagonia, northern limit some way south of the Rio Negro, extending thence to the Chubat and beyond that river, very common in some parts (No. 148, G. C.). A shrub 4–5 feet high, with the heads (involucral scales) bright yellow, flowering in summer (December and January). The leaves prick like needles, but easily drop off from the dried specimen. This is a larger and stronger plant than the allied *C. erinacea*. The leaves, which are quite glabrous, are broader below, terminating in a sharp brown point. There is slight araneous pubescence (cobweb) about the margin of the involucral scales.

CHUQUIRAGA KINGII, n. sp. Extends from the mountains of Treñeta southward to the Chubat and beyond that river (No. 146, G. C.). I have received but a very incomplete fragment of this undescribed species, but it is evidently the same as two specimens in the Kew Herbarium; the first, from Port St. Elena, collected by Captain King, the second, labelled "Patagonia," from Captain Middleton. I subjoin a brief diagnostic character which may serve to identify the plant.

Chuquiraga Kingii differt a proxima *C. spinosa*, Don, spinis axillaribus brevissimis, foliorum nervis lateralibus obsoletis, et præsertim involucri squamis latioribus apice cartilagineo submuticis, nec in mucronem spinescentem acuminatis. In hac specie squamæ interiores flavæ, nec ut in *C. spinosa* saturate aurantiacæ.

The Indians distinguish the above-mentioned three species of *Chuquiraga*, and the Patagonian name for this is *Amtrac-tractschic.*

TRICHOCLINE HETEROPHYLLA, *Less.* Very common about Bahia Blanca (No. 141, G. C.). Called by the Spaniards *Chucho*, but improperly, as the true *Chucho* is a Solanaceous plant.

NASSAUVIA ROSULATA, =Acanthophyllum rosulatum, *Hook. & Arn. Comp. Bot. Mag.* ii. p. 43 (Nos. 88 and 145, G. C.). A stunted shrub growing in rough stony ground in Patagonia from the Rio Negro southward to the Chubat and beyond that river. It is used to make rude combs for the Indian women; and as the root is very tough, the Patagonians, who call it *Yahenelc*, drag it up by passing the leather thong which is attached to the saddle of the horse round the base of the stem. This is a curious plant which, though apparently common in Patagonia, is rare in herbaria. There are but two fragments in the herbarium at Kew; the first collected by Darwin at Port Desire, the other somewhere on the coast of Patagonia by Captain Middleton. It belongs to a small group including two other species from the Chilian Andes, first described by Lagasca, and referred by him to *Triptilion*, but more correctly placed in the genus *Nassauvia* by Don in 1832. Soon after, on account of their very peculiar habit and mode of growth, they were constituted into a separate genus by Hooker and Arnott (Comp. Bot. Mag. i. p. 37) under the name *Acanthophyllum*. That name having been previously adopted for a very different genus by C. A. Meyer, the group received the name *Strongyloma* in DC. Prod. vii. p. 51. In the present species the upright stems have very numerous branches, which are reduced to rounded glomerules of minute leaves about the size of a pea, with usually 1, sometimes 2, small flowering heads at the apex. My specimens have no primary leaves; but in Darwin's specimen these much resemble the involucral scales, having a strong medial nerve which is produced to a sharp spiny point. I have not seen specimens of *Nassauvia glomerulosa*, Don (*Strongyloma*, DC.

Prod.), which is said to grow in the higher region of the Chilian Andes; but from the description it appears to be so similar to the Patagonian plant, that the latter should, perhaps, be referred to it as a variety.

SONCHUS ASPER, *Fl. Dan.* Naturalized, and now widely spread (No. 49, G. C.). This and the nearly allied *S. oleraceus* are widely spread throughout tropical and temperate South America, and their diffusion has probably been to a great extent independent of the agency of man.

HYPOCHŒRIS —— ? Common throughout the province of Buenos Ayres (No. 194, G. C.). The specimen is in bad condition, and too imperfect for recognition.

PLUMBAGINEÆ.

STATICE BRASILIENSIS, *Boiss.* Salt-marshes of Tuyu, and in North Patagonia (No. 102, G. C.). The Patagonians call this *Guaïcuru*, and make a deep-red decoction from the roots, used in popular medicine to purify the blood.

PRIMULACEÆ.

ASTEROLINON SERPYLLIFOLIUM, = Lysimachia serpyllifolia, *Poir.*, = Pelletiera verna, *A. St.-Hil.* Bahia Blanca (No. 69, G. C.). I do not feel sure that *Pelletiera serpyllifolia*, Webb, Phyt. Can., is the same as the South-American plant.

APOCYNACEÆ.

MENODORA —— ? From the base of the Sierra de la Ventana near Bahia Blanca (No. 218, G. C.). Of this I have a mere fragment without leaves; but it does not agree well with any of the described species. From *M. decemfida*, to which it approaches, it differs by a larger corolla and the form of the calyx.

ASCLEPIADEÆ.

BRACHYLEPIS CANDOLLEANUS, *Hook. & Arn.* N. Patagonia, flowering late in autumn (April, May). Also found on the Sierra de la Ventana and in Entrerios (No. 213, G. C.).

*PHILIBERTIA SOLANOIDES, *H. B. K.*, = Sarcostemma incanum, *Dcne.* At Tuyu, near Cabo S. Antonio; also seen in Entrerios (No. 227, G. C.). This climbs up the stems of Gramineæ and other small plants.

*OXYPETALUM SOLANOIDES, *Hook.* At Ajó, near Cabo S. Antonio (No. 165, G. C.).

HYDROPHYLLACEÆ.

PHACELIA GLANDULOSA, *Nutt.*, var. PATAGONICA. South of province of Buenos Ayres (No. 211, G. C.). A very imperfect fragment, but evidently the same as a plant in Kew Herbarium gathered by Darwin at Bahia Blanca, and another from the Patagonian coast, sent by Captain Middleton. It differs from the variety *neo-mexicana* by a smaller corolla and less exserted stamens and style.

BORAGINEÆ.

HELIOTROPIUM ANCHUSÆFOLIUM, *Poir.*, var. ANGUSTIFOLIUM. Marshes of the Naporta Chico near Bahia Blanca (No. 119 *b*, G. C.). This was collected and sent along with *Stemodia lanceolata,* Benth.

HELIOTROPIUM CURASSAVICUM, *L.*, var. PARVIFLORUM. Salt-marshes at the mouth of the Rio Negro, and elsewhere in Patagonia and Buenos Ayres (No. 221, G. C.).

ERITRICHIUM —— ? Valley of the Rio Negro on moist ground (No. 199, G. C.). I am unable to determine this plant, not finding it possible to fix the characters of the numerous American species with minute flowers. It has some resemblance to *E. albiflorum*, Griseb. (*Myosotis albiflora,* Banks. & Sol.), but cannot, I think, be referred to that species. Its true position, I believe, either as a variety or as a distinct species, is between *E. californicum,* A. DC., and *E. tenellum,* Gray.

SOLANACEÆ.

SOLANUM ELEAGNIFOLIUM, *Cav.* South of the province of Buenos Ayres (No. 81, G. C.). This plant, whose original home is the subtropical zone of South America, appears to have followed the spread of colonization southward. It is very common about inhabited places, and a troublesome weed in cultivated soil.

SOLANUM —— ? About Bahia Blanca, and along the valley of the Rio Negro (Nos. 55 and 99, G. C.). The Araucanian Indians cook the leaves and eat them as a vegetable, calling the plant *Liaghé.* Without a familiar acquaintance with the plants in their home, it is not easy for a botanist to find his way among the many hundred species of *Solanum* described from South America. This is certainly the same as Argentine specimens (unnamed) preserved in Kew Herbarium from Tweedie and Miers. It is nearest to *S. Tweedianum*, Hook., but much smaller than that species. Whether it should be ranked as a variety or as a distinct species, I will not attempt to determine.

PHYSALIS VISCOSA, *L.* This is widely spread from Entrerios through the province of Buenos Ayres to the Rio Negro, and beyond it in North Patagonia, but always near inhabited places (No. 175, G. C.). This is commonly called *Camanbú*, a Guarani name, showing that the plant has spread from the north (*i. e.* Brazil). The same name is given to the fruit of another Solanaceous plant which has also spread from South Brazil to Patagonia, *Salpichroma rhomboideum*, Miers *. The Araucanian Indians have no name for the present species, but call the fruit *Kilièn*, the name given to the Strawberry (*Fragaria chilensis*).

LYCIUM FILIFOLIUM, *Gill.*, var. = L. minutifolium, *Miers, Ill. S. Am. Pl.* ii. p. 130. Bahia Blanca and through North Patagonia (No. 158, G. C.). This is common about Buenos Ayres, but appears to have been introduced there. The Araucanian name is *Tschayem*. This is a small bush, 2–3 feet in height, with feeble branches, which, when not supported, usually rest on the ground.

LYCIUM ——? Bahia Blanca; Sierra de la Ventana; North Patagonia (No. 208, G. C.). Araucanian name *Huingan*, called by the Spaniards *Mataperro*, probably because dogs, attempting to penetrate the bushes, are seriously injured by the sharp tough spines. I cannot identify this with any described species; but as there are several of which I have not seen specimens, I hesitate to give this a name. It agrees with an unnamed specimen in Kew Herbarium from the Rio Negro, from Wilkes's Exploring Expedition, and approaches *L. elongatum*, Miers; but is, I think, certainly different. In the present plant the calyx is minute, with very short segments, the corolla attenuated, almost entire, scarcely lobed, but rather crenated at the mouth; the pedicels, which are very short in flowering-time, are somewhat elongated when the plant bears its bright-red berries. The leaves are small, linear-spathulate. If, as I believe, undescribed, it may properly be called *Lycium Wilkesii.*

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* I may remark that the locality "Magellania," given by Dunal in DC. Prod. for this *Salpichroma*, on the supposed authority of Commerson, is an indubitable mistake. Commerson found the plant near Monte Video.

CESTRUM PARQUI, *L'Hér.*, var. South of the province of Buenos Ayres (Nos. 174 and 219, G. C.). This species, almost universal in South America, is extremely variable. M. Claraz's specimen represents a small and slender form.

PETUNIA NYCTAGINIFLORA, *Juss.* North Patagonia, Sierra de la Ventana, Sierra de Tandil (No. 192, G. C.). This was known to extend from South Brazil to Buenos Ayres; but M. Claraz has added considerably to its known area.

NIEREMBERGIA HIPPOMANICA, *Miers.* On the dry stony and rocky plateaux near Bahia Blanca, and through North Patagonia (No. 135. G. C.).

NIEREMBERGIA RIGIDA, *Miers.* Common about Bahia Blanca (No. 144, G. C.). This is very near to, and perhaps only a variety of, *N. filicaulis*, Lindl.

SCROPHULARINEÆ.

LINARIA CANADENSIS, *Spr.* Banks of the Naporta near Bahia Blanca (No. 72, G. C.). This has possibly been introduced by man; but the species is very widely spread through the American continent.

STEMODIA LANCEOLATA, *Benth.* Marshes of the Naporta Chico near Bahia Blanca (No. 119, G. C.). Flowers of a violet-blue tint. This species appears to extend from the northern provinces to the extreme south of the Argentine territory.

HERPESTIS RADICATA, *Bentham.* Same locality as the last species (No. 118, G. C.).

SCOPARIA FLAVA, *Cham. et Schlecht.* Same locality as the two preceding species (No. 118 *b*, G. C.).

GERARDIA GENISTÆFOLIA, *Cham. et Schlecht.* Sierra de la Ventana and Sierra de Tandil (No. 161, G. C.). Flowers full rose-colour.

VERBENACEÆ.

LANTANA CLARAZII, n. sp. Plateaux of North Patagonia above the valley of the Rio Negro, flowering in spring (September) (No. 214, G. C.). I subjoin a brief description of this very distinct plant:—

Fruticulus ramosissimus; foliis (saltem superioribus) sessilibus, lineari-lanceolatis, utrinque attenuatis, margine subintegerrimo sæpius revoluto, nervo medio prominente, lateralibus obsoletis; floribus capitatis in spicas brevissimas ramorum lateralium terminales congestis; bracteis floriferis ovatis pubescentibus calyci subæquilongis; calyce tubuloso brevissime 4-dentato; corollæ tubo exserto, paululum recurvato, fauce bilabiato. Ob fructum ignotum inter *Lantanam* et *Lippiam* subambigua, priori tamen, ut videtur, referenda.

The nearest ally appears to be *Lantana Sellowiana*, Link, from which, however, it differs both in habit and structural characters.

LIPPIA LYCIOIDES, *Steud.* Bahia Blanca and North Patagonia (No. 133, G. C.). The leaves, which are very aromatic, are put into the Paraguay tea; and they are also used medicinally in infusion. The Spaniards call the plant *Polèo*; the Araucanian name is *Tschoïké mamuel*, meaning ostrich-wood.

LIPPIA SERIPHIOIDES, *A. Gray.* Bahia Blanca and through North Patagonia, extending westward to the Cordillera (No. 84, G. C.). This is a characteristic species of the Patagonian flora, not extending far beyond, unless perhaps along the flanks of the Cordillera. It is called in Spanish *Tomillo del Campo*, and in Araucanian *Loom*. It is used as thyme for flavouring soup &c., and the infusion, which is aromatic with a bitter taste, is used medicinally. From a note by Tweedie on a label in Kew Herbarium, it appears that in his time, nearly fifty years ago, it was sent from the south to Buenos Ayres, and sold by apothecaries. Though long in herbaria, having been collected near Bahia Blanca by Darwin, and on the Patagonian coast by several succeeding travellers, this appears to have been first published by Asa Gray. The manuscript name "*L. rubiginosa*, Gill.," is affixed to specimens collected near Mendoza by Gillies; but that specific name has been applied to a very different plant by Schauer in DC. Prod. xi.

*VERBENA LITORALIS, *Kunth.* Tuyu, near Cabo S. Antonio (No. 222, G. C.).

VERBENA BONARIENSIS, *L.* Valleys of the Rio Colorado and the Rio Negro (No. 224, G. C.). Grows in damp ground and by water-courses. Flowers rose-colour or violet.

VERBENA TEUCRIOIDES, *Gill. & Hook.* Common at Bahia Blanca and in North Patagonia; flowers white (No. 138, G. C.).

VERBENA ERINOIDES, *Lam.* Bahia Blanca; North Patagonia (No. 139, G. C.). This has lilac flowers, with a scent of Vanilla, which come out early (November).

VERBENA INCISA, *Hook.*? Bahia Blanca (Nos. 163 and 204, G. C.). The specimens are very incomplete fragments, and the name therefore rather uncertain. The flowers are red, and the plant is commonly called *Margarita*.

LABIATÆ.

HEDEOMA MULTIFLORA, *Benth.* Bahia Blanca and North Patagonia (No. 125, G. C.). This plant, called by the Spaniards *Menta del Campo*, is much used medicinally, the decoction being considered a remedy for diarrhœa and various stomach derangements. From the fact of having no Indian name, M. Claraz supposes the plant to be of recent introduction into Patagonia. It was, however, long ago found by Gillies, Tweedie, and others at various places in the south and west parts of the Argentine territory, while it extends northward to South Brazil.

PLANTAGINEÆ.

PLANTAGO MAJOR, *L.* Common at Ajó and elsewhere (No. 196, G. C.). Doubtless introduced from Europe.

PLANTAGO PATAGONICA, *Jacq.*, var. Bahia Blanca and North Patagonia, very common (No. 127, G. C.). Among a large set of specimens of this very variable species, I find none quite agreeing with this variety. It comes nearest to the form most common in North America (*P. gnaphaloides*, Nutt.). The pubescence, especially of the calyx, is abundant, cottony, white, and not, as in many forms of the species, rufous.

PLANTAGO BISMARCKII, *Niederl.* Sierra de la Ventana (No. 60, G. C.). This is a curious and very distinct species, described by Niederlein in the 'Monatschrift zur Beförderung des Gartenbaus in d. k. Preussischen Staaten' for 1881, p. 16. It forms a small bush, 1 to 2 feet high, with a woody stem nearly an inch in diameter, and numerous crowded tufts of linear-subulate leaves on the lateral branches.

ILLECEBRACEÆ.

PENTACÆNA POLYCNEMOIDES, *Bartl.*, var. Bahia Blanca; Sierra de la Ventana: North Patagonia, extending to the foot of the Cordillera (Nos. 68 and 70, G. C.). The Indians call this *Ancue*, and use the infusion for stomach complaints.

AMARANTACEÆ.

AMARANTUS CHLOROSTACHYS, *Willd.* Bahia Blanca, where it was found by Darwin; North Patagonia; about Cabo S. Antonio (Nos. 177 and 178, G. C.). The young plant is eaten as a vegetable like spinach.

PUPALIA ——? Bahia Blanca and North Patagonia. Flowers yellowish white (No. 184, G. C.). A mere fragment, as to which I am quite uncertain.

GUILLEMINEA LANUGINOSA, *Moq.* (sub *Gossypiantho*). In the province of Buenos Ayres, ruderal (No. 47, G. C.). Also seen in Entrerios.

PFAFFIA LANATA, *Poir.* (sub *Gomphrena*). Bahia Blanca; North Patagonia. Also grows in Entrerios (Nos. 56 and 101, G. C.).

ALTERNANTHERA ECHINATA, *Sm.* Ruderal throughout the province of Buenos Ayres (No. 46, G. C.).

GOMPHRENA VILLOSA, *Mart.* Sierra de Tandil; flowering late (March) (No. 124 *b*, G. C.). Sent along with the next species, from which it is certainly different.

GOMPHRENA ROSEA, *Griseb.*? Bahia Blanca and North Patagonia (No. 124 *a*, G. C.). This is said to flower in February in the south, but a month earlier in Entrerios. The flowers (*i. e.* coloured bracts) are of a bright rose-colour. The specimen is a mere scrap, as to which I am not quite certain.

CHENOPODIACEÆ.

CHENOPODIUM ALBUM, *L.* Throughout the province of Buenos Ayres (No. 42, G. C.).

CHENOPODIUM MURALE, *L.*? Bahia Blanca and elsewhere, common (No. 197, G. C.). The specimen has neither flower nor fruit.

CHENOPODIUM AMBROSIOIDES, *L.* Everywhere about Bahia Blanca &c. (No. 40, G. C.). Commonly called *Paico hembra.*

CHENOPODIUM AMBROSIOIDES, *L.*, var. ? Common at Bahia Blanca and elsewhere (No. 41, G. C.). This is sent as a different plant from the last, and said to be called *Paico macho*; but it appears to be no more than one of the numerous varieties of that protean species.

ATRIPLEX PAMPARUM, *Griseb.* Near Cabo S. Antonio (No. 166, G. C.). I suspect that this must be ranked as a variety of *A. patagonica.*

ATRIPLEX LAMPA, *Gill.*, var. ANGUSTIFOLIA ? Valley of the Upper Limay (No. 99, G. C.). This is very possibly an undescribed species of the Section *Obione*, and certainly allied to *A. Lampa*, Gill. My specimen represents the male plant only. The whole plant is hoary white, very much branched, the male flowers in little spherical or egg-shaped heads.

HETEROSTACHYS RITTNERIANA, *Ung. Sternb.* ? Salt-marshes at Bahia Blanca (No. 180, G. C.). The Araucanian name is *Tschilpé.* The specimen is incomplete; and in this very difficult group I feel no certainty. This may possibly belong to the closely allied *Spirostachys patagonica*, Hook. fil.

SALICORNIA FRUTICOSA, *L.*, var. PERUVIANA. Salt-marshes of the Rio Colorado (No. 183, G. C.). The native name for this and several other succulent plants growing in salt-marshes is *Gume.*

POLYGONACEÆ.

RUMEX MAGELLANICUS, *Griseb.* In the valleys of all the rivers and principal streams draining North Patagonia (No. 128, G. C.). The inflorescence is of a rich purple-red hue. The Indian name is *Calcatréo.* Though a well-marked form, this seems to be closely allied to *R. cuneifolius*, Campd.

RUMEX PRATENSIS, *Mert. & Koch.* Valley of the Rio Negro, North Patagonia (No. 160, G. C.). Perhaps introduced from Europe?

RUMEX CONGLOMERATUS, *Murr.* At Tuyu and Ajó (No. 231, G. C.). I suppose that this must be ranked among the forms of the cosmopolitan *R. sanguineus*, L.

POLYGONUM CAMPORUM, *Meisn.*, var. AUSTRALE. At Tuyu (No. 223, G. C.).

MUEHLENBECKIA CHILENSIS, var. **INJUCUNDA**, *Meisn. in DC. Prodr.* Valley of the Limay, North Patagonia (No. 86, G. C.). This is commonly called *Salsaparilla*, and is used medicinally.

SANTALACEÆ.

ARJONA PATAGONICA, *Hombr. et J.*,=A. tuberosa, *Cav.*, var. patagonica, *A. DC.* Bahia Blanca; North Patagonia (No. 126, G. C.). This is called *Macachina* by the Spaniards, and *Sakel* by the Araucanian Indians. In winter one or more tubers, about an inch long and half as thick, are developed. These are eaten, either raw or cooked. The tubers are detached from the parent stem when the plant flowers in spring. M. Claraz states that, further south in Patagonia, beyond the Chubat, this species is replaced by a different one, which produces longer and thinner tubers. I have not seen several of the species (or forms) described by Mr. Miers in the Journal of the Linnean Society, xvii.

IODINA RHOMBIFOLIA, *Hook. & Arn.* Widely spread, but not common, extending from the northern frontier of Patagonia to Entrerios and Uruguay, and to the interior of the Argentine territory (Nos. 142 and 190, G. C.). This shrub occurs here and there in small groves at wide intervals, usually on dry ground. One of M. Claraz's specimens comes from the Salina Chica, 12 leagues west of Bahia Blanca, and another grove is at the foot of the Sierra de la Ventana. The Araucanian name is *Trallian*. At Bahia Blanca the Spaniards call it *Sombretoro*; but in Entrerios that name is given to a species of *Maytenus*.

URTICACEÆ.

URTICA SPATHULATA, *Sm.* Common about Bahia Blanca, in ruderal stations, and especially around the *bizcacheros* (No. 44, G. C.). This seems to be nearly allied to the Andean *U. echinata*, Benth.

BROMELIACEÆ.

TILLANDSIA COARCTATA, *W.*? Valley of the Rio Negro and elsewhere in North Patagonia, on the branches of shrubs (No. 207, G. C.). The specimen is too imperfect to be determined with certainty; it undoubtedly belongs to the group *Diaphoranthema*. A good many species of *Tillandsia* have been recorded from the northern and central parts of the Argentine territory, but the extension of the genus so far southward as Patagonia is, I believe, altogether new.

IRIDEÆ.

SISYRINCHIUM CHILENSE, *Hook.* Extends southward from Entrerios through the province of Buenos Ayres to the borders of Patagonia. Common at Bahia Blanca (No. 113, G. C.). This is called by the Spaniards *Thé pampa* and by the Indians *Picun pelia.* The infusion is used as tea, and is valued as a sudorific.

SISYRINCHIUM CLARAZII, *Baker MSS.* Bahia Blanca (No. 112, G. C.). On showing this plant to Mr. Baker, whose knowledge of this natural order is so extensive and complete, he at once pronounced it to belong to an undescribed species; and he has been good enough to draw up a description, with the remarks which I subjoin:—

"*S. Clarazii*, Baker; acaule, dense cæspitosum; foliis basilaribus 3–4 rigidulis, anguste linearibus, scapo brevioribus; scapo 3–4-pollicari, conspicue ancipite; florum fasciculis 2–3, singulis 2–3-floris, ad scapi apicem aggregatis; spathæ valvis exterioribus duris, lanceolatis, infima exteriore in apicem foliaceum producta; pedicellis ex spatha protrusis; perianthii segmentis obverse lanceolato-oblongis, luteis, venis pluribus nigro-brunneis parallelis percursis; filamentis liberis; capsula subglobosa glabra.

"A dwarf acaulescent densely tufted yellow-flowered species, with a conspicuously two-edged flower-stalk, allied to *S. pusillum*, *S. bogotense*, and *S. tinctorium*, H. B. K. The leaves are rigid in texture, not more than half a line broad, with about seven distinct ribs. The perianth is about $\frac{1}{4}$ inch in length."

From a note of M. Claraz, it appears that this is used for tea in the same manner as *S. chilense.*

AMARYLLIDEÆ.

ZEPHYRANTHES ANDERSONI, *Herb.* North Patagonia; also seen in Entrerios (No. 76, G. C.). Springs up commonly after the rains.

LILIACEÆ.

BRODIÆA AUREA, *Benth. & Hook. f.* ?, = Milla aurea, *Baker.* Bahia Blanca, common after the rains (No. 35, G. C.). The specimen is very imperfect, and the determination somewhat uncertain.

JUNCACEÆ.

JUNCUS ACUTUS, *L.* Bahia Blanca and elsewhere, common (No. 37, G. C.). The succulent rhizomes are sought after by pigs at Bahia Blanca.

TYPHACEÆ.

TYPHA ANGUSTIFOLIA, *L.* Extends from the valleys of North Patagonia, through the provinces of Buenos Ayres and Entrerios (No. 229, G. C.). The Spanish name is *Totara*, the Araucanian *Trapal.* This cosmopolitan species probably owes its dissemination to water-birds, and not to the agency of man.

CYPERACEÆ.

CYPERUS VEGETUS, *Willd.* Valley of the Rio Negro (No. 171, G. C.).

SCIRPUS MARITIMUS, *L.* Common at Tuyu and elsewhere (No. 234, G. C.). In default of better material, this is sometimes used for thatching.

SCIRPUS —— ? Valley of the Rio Negro (No. 170, G. C.). A very imperfect fragment, not determinable.

CAREX PHALAROIDES, *Kunth.* Bahia Blanca, on banks of streams (No. 77, G. C.).

CAREX RIPARIA, *L.* Bahia Blanca, North Patagonia, and throughout the province of Buenos Ayres; common along watercourses (No. 38, G. C.). This is the form described as *C. incrassata*, Schlecht.

GRAMINEÆ.

SETARIA CAUDATA, *Roem. & Sch.* Bahia Blanca and North Patagonia, common (Nos. 11 and 179, G. C.).

SPARTINA COARCTATA, *Trin.* Bahia Blanca, and also from Tuyu (No. 225, G. C.). A tall, wiry grass, used for thatching.

ANDROPOGON ARGENTEUS, *DC.* Bahia Blanca (No. 14, G. C.).

CHRYSOPOGON STIPOIDES, *Trin.* (*ex Munro, MSS.*), = Sorghum nutans, *A. Gray* (*L. sub* Andropogone), = Andropogon avenaceus, *Michx.* Valley of the Naporta Grande, district of Bahia Blanca (No. 9, G. C.). This species was collected somewhere near Bahia Blanca by Darwin. It has a wide geographical range in the American continent. According to strict rules of nomenclature, this should be named *Chrysopogon nutans*, the latter being the trivial name given by Linnæus; but it seems undesirable to add to the present synonymy.

ALOPECURUS GENICULATUS, *L.*, var. ARISTULATUS, =A. aristulatus, *Michx.* Valley of the Rio Negro and elsewhere, in moist situations (No. 198, G. C.). Commonly called *Gramilla de bañado.*

ARISTIDA SETIFOLIA, *H. B. K.* Bahia Blanca (No. 30, G. C.).

STIPA INTERMEDIA, *Trin.* Bahia Blanca (No. 20, G. C.). Exactly agrees with a specimen collected by Darwin near Bahia Blanca, and named by Munro.

STIPA BICOLOR, *Vahl.* Bahia Blanca (No. 22, G. C.).

STIPA CAUDATA, *Trin.* Bahia Blanca and elsewhere, common on the plateaux (No. 19, G. C.). A specimen collected by Tweedie from the "plains of Patagonia," and named by Munro, differs only in the awns being somewhat shorter.

STIPA PULCHELLA, *Munro MSS.* Bahia Blanca and North Patagonia (No. 25, G. C.). This is scarcely different from *S. pogonathera,* Desv.

STIPA CLARAZII, n. sp. Bahia Blanca (No. 21, G. C.). This appears to be well distinguished from all the described species, and deserves to bear the name of its discoverer. I subjoin a brief description:—

Stipa Clarazii. Perennis, culmis 2–3-pedalibus; foliis radicalibus filiformibus, involutis, flexuosis, vix rigidis, caulinis ex vagina ampla subinflata latiusculis, apicem versus involutis, basin versus margine subscariosis, eximie striatis; paniculæ laxæ ramis 1–2-pollicaribus; glumis pro grege maximis, fere pollicem longis, superiore paullo longiore apice acuminata; glumæ fertilis pilis albis sericeis, arista elongata 2–3-pollicari, scabro-villosa.

POLYPOGON MONSPELIENSIS, *L.* Very common in the province of Buenos Ayres, about Bahia Blanca, in the valley of the Rio Negro, and elsewhere (Nos. 12, 172, and 230, G. C.).

PAPPOPHORUM ALOPECUROIDES, *Vahl*, var.? Bahia Blanca (No. 74, G. C.). In Kew Herbarium several specimens, seemingly widely different, have been placed in the same cover by General Munro. Some are tall grasses, with a much-branched and well-furnished panicle, others dwarfed, with a few nearly sessile spiculæ. There are, however, intermediate forms, and it remains for closer study to decide whether they should be united as varieties of a single species.

GYNERIUM ARGENTEUM, *Nees ab Esenb.* Bahia Blanca and North Patagonia (No. 28, G. C.). The Spanish name for this wide-spread species is *Cortadera*.

KŒLERIA CRISTATA, *Pers.* Bahia Blanca, common (No. 10, G. C.). Doubtless introduced from Europe, but not included in Berg's 'Enumeracion.'

ERAGROSTIS MEGASTACHYA, *Kœl.* Common about Bahia Blanca (Nos. 16 and 26, G. C.). Confined to the neighbourhood of inhabited places and cultivated ground, and apparently introduced. Called *Gramilla*.

ERAGROSTIS DELICATULA, *Trin.* Bahia Blanca and North Patagonia (No. 18, G. C.). This species affords good pasture in the valleys.

MELICA MACRA, *Nees ab Esenb.* Common about Bahia Blanca (No. 36, G. C.). This is called *Pasto bravo*, or wicked grass. It is scarcely more than a variety of *M. papilionacea*, L.

MELICA VIOLACEA, *Cav.* Very common at Bahia Blanca and through North Patagonia (No. 15, G. C.). The Araucanians call this *Nahuel catschu*, probably because the puma is supposed to crouch in the thick of it.

DISTICHLIS MARITIMA, *Raf.*, = Brizopyrum spicatum, *Hook. & Arn.* Sandy and salt soil at Bahia Blanca; in North Patagonia and at Ajó (No. 233, G. C.). Called *Gramilla de Salitral*.

BRIZA LAMARCKIANA, *Nees ab Esenb.*, = Chascolytrum subaristatum, *Desv.* Bahia Blanca, on the plateaux (No. 13, G. C.).

POA ALOPECURUS, *Kunth.* Widely spread from Entrerios through Buenos Ayres to North Patagonia (No. 31, G. C.). Araucanian name *Fuèo catschu*.

POA LANIGERA, *Nees ab Esenb.* Bahia Blanca (No 32, G. C.).

POA DENUDATA, *Steud.* Bahia Blanca (No. 33, G. C.).

POA DENUDATA, *Steud.*, var. MINOR. Bahia Blanca (No. 34, G. C.).

*GLYCERIA FLUITANS, *R. Br.* Tuyu &c., in province of Buenos Ayres; also in Entrerios (No. 230, G. C.). Introduced, but perhaps not by the agency of man.

FESTUCA BROMOIDES, *auct.* (*incluso Munro*), *non L.* Very common at Bahia Blanca (No. 29, G. C.). Doubtless introduced from Europe.

BROMUS UNIOLOIDES, *H. B. K.* (Ceratochloa, *auct.*). Common in the province of Buenos Ayres and about Bahia Blanca (Nos. 24 and 27, the latter a small form, G. C.). The Araucanians call this grass *Lancu*, and formerly used the pounded seeds as food. M. Claraz supposes this to be an introduced species; but it is widely spread as an indigenous plant in South America, and appears to have been long known to the Indians, therefore probably indigenous.

LOLIUM PERENNE, *L.* Bahia Blanca; a common ruderal plant (No. 17, G. C.). Introduced from Europe, but now widely spread in South America. The larger specimens represent the variety *brasilianum* of Nees, with the rhachis scabrous and the fertile glumes setiferous.

HORDEUM PRATENSE, *L.* Bahia Blanca, very common (No. 28, G. C.).

HORDEUM JUBATUM, *L.* Bahia Blanca and elsewhere (No. 226, G. C.). This has a very wide range, from the Arctic coast of North-west America to the Strait of Magellan. It is said to afford good herbage for cattle.

FILICES.

The following five species, along with *Adiantum cuneatum*, of which I have seen a specimen, were collected by M. Claraz in the mountains of Tandil and La Ventana; but no other ferns were observed by him during his very numerous excursions in the interior:—

CASSIBEERA TRIPHYLLA, *Kaulf.* (No. 5, G. C.)

PELLÆA TERNIFOLIA, *Fée.* (No. 1, G. C.)

CHEILANTHES MICROPTERIS, *Sw.* (No. 4, G. C.) Also seen in Patagonia.

BLECHNUM HASTATUM, *Willd.* (No. 3, G. C.) Also seen in Patagonia.

Aspidium capense, *Willd.* (No. 2, G. C.) Also seen in Patagonia.

Adiantum cuneatum, *Langsd.* No specimen in the collection.

P.S.—Since the foregoing pages were in type I have received the part relating to Botany of the official publication* respecting the expedition to the Rio Negro under General Roca in 1879, prepared by the late Professor Lorentz and Mr. G. Niederlein, who was the botanist of the expedition. The Catalogue includes 324 species or varieties of flowering plants, and 13 vascular Cryptogams. Of these 20 are described as new species, and as many as 66 are merely assigned to genera, but not specifically determined. Of the 258 named species of flowering plants only 53 are certainly identical with as many species in Mr. Claraz's collection; but I have reason to believe that a considerable portion of the unnamed species should also be included in that category. To account for so large an amount of difference, I may remark that the plants collected by Mr. Niederlein were all found in the interior, while a majority of Mr. Claraz's plants come from the coast-region. In both collections there are a good many species not yet certainly known to grow in Patagonia proper, as several of Mr. Niederlein's plants were found north of the Rio Colorado. His journey was effected in autumn and winter; and many of the specimens being in bad condition, it is easy to understand the difficulty of accurately determining the species. It is probable that the discrepancy between the two lists is partly due to differences between botanists working under very different conditions. I have not seen authentic specimens of many species named by MM. Lorentz and Niederlein, and they have not seen the types on which Hooker and Arnott and A. Gray have founded many species of this region.

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* Informe Oficial de la Comision Científica Agregada al Estado Mayor General de la Expedicion al Rio Negro (Patagonia) bajo las ordenes del General D. Julio A. Roca. Entrega II. Botánica. 4to, Buenos Aires, 1881.

Notes on Afghanistan Algæ. By Dr. JULIUS SCHAARSCHMIDT, Lecturer on Cryptogamic Botany and Vegetable Anatomy, Assistant in the Botanic Garden of the Royal Hungarian University at Kolosvár [Klausenburg]. (Communicated by Prof. OLIVER, F.L.S.)

[Read March 6th, 1884.]

(PLATE V.)

THE following list of Afghanistan Algæ is the result of the investigation of some dried Phanerogamic Plants collected in Afghanistan by J. E. T. Aitchison, F.L.S., Surgeon-Major in H.M. Bengal Army, in the Afghanistan Expedition of 1880.

I am indebted to Professor Dr. A. Kanitz, whose kindness has enabled me to draw up this account, for permitting me to examine many plants from the interesting duplicates distributed by the Kew Herbarium.

I found the enumerated Algæ chiefly adhering to the specimens of *Ammannia pentandra*, Roxb. ["417. Shalizán, in rice-fields, profuse"*], forming fine bluish-green incrustations around the stems and on the leaves. Many interesting forms were found (perhaps Bacillariaceæ) in the small earthy particles remaining attached to the roots. One species, viz. *Hantzschia Amphioxys*, was only found on the roots of *Anemone tetrasepala*, Royle [" 186, 237, 332=463 (1879). Saféd-koh range, on the margins of forests, and in open grassy slopes on the inner hills, at an altitude of from 7000 to 10,000 feet"†].

CYANOPHYCEÆ.

1. CHROOCOCCUS (SYNECHOCOCCUS? GLŒOTHECE?) sp.? (See *Anabæna* (*Cylindrospermum*))

2. GOMPHOSPHÆRIA APONINA, *Kützing*. Size of cells 0·004 millim.

3. OSCILLARIA sp.?

4. MICROCOLEUS AITCHISONII, n. sp. (Plate V. fig. 1.) *Microcoleus* aquaticus, strato ærugineo-chalybeo, trichomatibus æquali-

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* " On the Flora of the Kuram Valley &c., Afghanistan.—Part II." By J. E. T. Aitchison, F.L.S., Surgeon-Major H.M. Bengal Army. Journal of the Linnean Society, Botany, xix. Nos. 117-119 (1882), p. 162.

† *L. c.* p. 148.

bus in fasciculos filiformibus, articulis diametro subæqualibus vel paullo brevioribus, subtiliter granulatis, apiculo subobtusis vel obtuso-rotundatis; vagina universali crassa, undulato-constricta et transversim striata [ut in *Symphyosiphoni Thelephoroidi* (Montagne), Rabenhorst], achroa.—Differt ab aliis *Microcoleis* vagina distinctissime undulato-constricta, transversim striata. Crassitudo fascicul. 0·010 millim., vaginæ 0·016 millim.; diameter artic. 0·003 millim.

5. ANABÆNA (CYLINDROSPERMUM) sp.? (Plate V. figs. 2–10.) From the filaments of this *Anabæna* a *Chroococcus* arises in a very interesting manner. We find here a curious case of vegetative polymorphism of the Cyanophyceous Algæ (*Schizophyceæ*).

What some years before many conjectured as possible is by recent observers asserted as true, not only for the Cyanophyceous [*], but for the Chlorophyllophyceous[†] Algæ, viz., that many, if not all, the unicellular species, and some of the composite species of the Cyanophyceous Algæ, and perhaps of the Chlorophyllophyceous, are merely stages in the life-history of higher plants. These states being fixed, the different forms have been defined and distinguished as different species. It will probably be finally found that some of the so-called species of *Glœocapsa*, *Chroococcus*, &c., or, on the other hand, of *Cylindrocystis*, *Protococcus*, &c., have their own peculiar species of the higher Algæ, from which they spring, and into which alone they can develop.

In the order of Cyanophyceous Algæ species of *Glœocapsa* are degraded by recent discoveries as subordinate forms of higher Cyanophyceous Algæ, as *Sirosiphon*, *Oscillaria*, &c. *Glœocapsa Itzigsohnii*, Bornet, for example, was proved to be a peculiar state or development of *Sirosiphon Bornetii*, Zopf[‡].

Whilst no proof whatever has as yet been furnished for the vast majority of the plants of this Order (Cyanophyceæ), with regard to the genus *Anabæna* (*Cylindrospermum*), we will briefly characterize the interesting relation between a minute *Chroococcus* and *Glœothece* and a species of *Anabæna* (*Cylindrospermum*). The filaments of this *Anabæna* (*Cylindrospermum*) are composed of cylindrical or more or less globular cells. The spores are much larger than the ordinary cells, from which on their first appearance they are not readily distinguishable (Plate V. fig. 3*a*); but when the frond has attained a certain age, the spore-cells begin to enlarge, and finally assume a form and size apparently fixed; the matured spores are cylindrical, rounded at the ends, and surrounded with distinct yellowish coats. The relative position of spores and heterocysts is various. The contents of the heterocyst is paler, the colour of the cell-wall yellowish. The filaments are seen in division in Plate V. fig. 2. The cell at first seems merely to elongate until it obtains nearly twice its original length, when the division commences. A median constriction divides the cells into two daughter cells, the filaments then assuming a moniliform aspect. The cells are closely connected, no nuclei being discernible as in the *Noctoc*-cells*. By this process the filament rapidly increases in length; but at the ends the new joints become further separated until they are almost detached (Plate V. fig. 7*a*). The separated cells remain together and form irregular masses (Plate V. fig. 8) resembling *Synechococcus*. These changes were observed from dried material, but were traced from uninjured filaments, and remind us of the metamorphosis of *Polypothrix amphibia*, Zopf †.

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[*] W. Zopf, 'Zur Morphologie der Spaltpflanzen (Spaltpilze und Spaltalgen),' 1882.

[†] Cienkowski, "Ueber Palmellen-Zustand bei *Stigeoclonium*," Botanische Zeitung, xxiv. (1879), p. 17. For the further literature and for the *Protococcus* stage of *Conferva*, see Schaarschmidt, "Némely Chlorosporeák vegetativ alakváltozásairól," Magyar Növénytani Lapok, vii. (1883).

[‡] *L. c.* p. 58, t. vii. figs. 1–9.

Besides these filaments we have seen many of Conferva-like appearance (Plate V. figs. 3 and 4), which are composed of cells three or four times as long as broad (Plate V. figs. 3 and 4), filaments with swollen yellowish cell-walls (Plate V. fig. 5), and filaments which are composed of thicker-coated cells (Plate V. figs. 6*a* & *b*). The cells of these filaments (figs. 5 and 6) separate in a similar manner as before described. The result of the fragmentation (at the ends of the filaments) is a *Chroococcus* or *Glœothece*-form (Plate V. figs. 9 and 10). The cells delineated in figs. 9 and 10 spring from filaments of the shape and appearance of fig. 6. The *Glœothece*-form springs from the *Chroococcus*-

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* Schaarschmidt, 'A chlorophyllés a növényi sejtmag morphologiájához' (Contributions to the Morphology of the Chlorophyll and Vegetable Nucleus) 1881, p. 46, fig. 17.

† "Weitere Stützen für meine Theorie von der Inconstanz der Spaltalgen (Phycochromaceen)." Berichte d. deutschen Bot. Gesellsch. i. n. 7 (1883), p. 319, t. ix.

form from the rounded cells (fig. 9) by repeated division of these cells.

6. NOSTOC sp.? Size: family 0·135 millim.; cells 0·003 millim., by one third as long.

7. GLŒOTRICHIA sp.? Insufficient material. Size: cells at the base of the filament 0·007–0·008 millim. by one half as long; resting spore 0·015 millim. × 0·012 millim.; heterocyst 0·008 millim.

BACILLARIACEÆ.

8. ENCYONEMA VENTRICOSUM (*Kützing*), *Grunow*; *Van Heurck*, '*Synopsis des Diatomées de Belgique*,' t. iii. f. 15. Size 0·058 × 0·014 millim.

Also "forma inter *E. cæspitosum* et *Lunula*," Van Heurck, *l. c.* t. iii. f. 18. Size 0·033–0·046 millim. × 0·010–0·014 millim. In conjugation also.

9. STAURONEIS PHŒNICENTERON, *Ehrenberg*; *Van Heurck*, *l. c.* t. iv. f. 2. Size 0·070–0·078 millim. × 0·015–0·020 millim.

10. S. ACUTA, *W. Smith*, nov. f. *tenuis*; lateribus lævissime concavis, area lineari, non dilatata. (Plate V. fig. 11.) Long. 0·100 millim., lat. max. 0·014 millim.

11. S. DILATATA, *W. Smith*, *British Diatomaceæ*, p. 60, t. xix. f. 191. Size 0·046 × 0·016 millim.

12. S. ANCEPS, *Ehrenberg*, nov. f. *intermedia*. Between the figs. 4 and 5 of Van Heurck, *l. c.* t. iv.; bridge parallel. Size 0·060 × 0·012 millim.

—— nov. f. *tenuicollis*; sub polis valde constricta. (Plate V. fig. 12.) Long. 0·040 millim., lat. max. 0·012 millim.

13. NAVICULA VIRIDIS, *Kützing*, var. *commutata*, Grunow, Van Heurck, *l. c.* t. v. f. 6.

—— nov. f. *longior*. Size 0·060 × 0·010 millim.

14. N. BREBISSONII, *Kützing*; *Van Heurck*, *l. c.* t. vi. Size 0·060–0·098 millim. × 0·010–0·015 millim.

15. N. TABELLARIA (*Ehrenberg*, *p. p.*), *Grunow*. Size 0·070–0·078 millim. × 0·011–0·020 millim.

16. N. APPENDICULATA, *Kützing*; *Van Heurck*, *l. c.* t. vi. f. 18. Size 0·038 × 0·008 millim.

17. NAVICULA OBLONGA, *Kützing*; *Van Heurck*, *l.c.* t. vii. f. 1. Size 0·064 × 0·014 millim.

18. N. AMBIGUA, *Ehrenberg*; *Van Heurck*, *l. c.* t. xii. f. 5. Size 0·100–0·105 millim. × 0·022 millim.

19. N. LIMOSA, *Kützing*; *δ. bicuneata*, Grunow, in Verhandl. d. zool.-bot. Gesellsch. Wien, x. (1860), t. v. (3) f. 7. Size 0·045 × 0·014 millim.

20. GOMPHONEMA GRACILE, *Ehrenberg*, f. *major*, Grunow; Van Heurck, *l. c.* t. xxiv. f. 12. Size 0·060 × 0·010 millim.

21. G. DICHOTOMUM, *W. Smith* (G. dichotomum, *Kützing*, p. p.); *Van Heurck*, l. c. t. xxiv. f. 19, 20. Size 0·030 × 0·008 millim.

22. G. PARVULUM (*Kützing*), *Grunow*; *Van Heurck*, *l. c.* t. xxv. f. 9. Size 0·022 × 0·008 millim.

23. SYNEDRA sp.?

24. FRAGILARIA sp.? Size 0·052 × 0·004–0·005 millim.

25. HANTZSCHIA AMPHIOXYS (*Ehrenberg*), *Grunow*; *Van Heurck*, *l. c.* t. lvi. f. 1. Sáfed-koh, on the roots of *Anemone tetrasepala*, Royle.

Var. VIVAX, *Grunow*; *Van Heurck*, *l. c.* t. lvi. f. 6. Size 0·100 × 0·015 millim.

26. NITZSCHIA VERMICULARIS (*Kützing*), *Hantzsch*; *Van Heurck*, l. c. t. lxiv. f. 2. Size 0·135 × 0·012 millim.

27. SURIRAYA ANGUSTA, *Kützing*; *Van Heurck*, *l. c.* t. lxxiii. f. 13. Size 0·038 × 0·011 millim.

28. SURIRAYA sp.?

DESMIDIACEÆ.

29. EUASTRUM SPINULOSUM, *Delponte*, subsp. *inermis*, Nordstedt, De Algis et Characeis, p. 9, t. i. f. 17.

Var. nov. OLIVERI; lobis tumoribus et verrucis in circulo dispositis munitis. (Plate V. fig. 18.) Long. 0·048–0·058 millim., lat. 0·040–0·050 millim., lat. isthmi 0·016 millim.

30. COSMARIUM BOTRYTIS (*Bory*), *Meneghini*.

Var. nov. AFGHANICUM. (Plate V. fig. 19.) Membrana tota verrucis minutissimis in series regulares peripherias et radiantes

concentricas ordinatis munita. Long. 0·056 millim., lat. 0·044 millim.

31. COSMARIUM PULCHERRIMUM, *Nordstedt, in Warming's Symbolæ ad floram Brasiliæ*, p. 175, t. iii. f. 24. Also in division. Size 0·050 × 0·040 millim.

32. C. UNDULATUM, *Corda*; *Wittrock, Anteckningar om Skandinaviens Desmidiacéer*, p. 11, f. 3.

Var. nov. ORNATUM. (Plate V. fig. 23.) Membrana tota puuctis distinctis in series radiantes ordinatis munita. Long. 0·020 millim., lat. 0·013 millim.

33. C. AITCHISONII, n. sp. (Plate V. fig. 20.) *Cosmarium* parvum, subhexagonum, tertia parte longius quam latius, profundissime constrictum, sinu lineari; semicellulæ subtrapezicæ, sursum angustatæ, dorso subrotundatæ, lateribus subconvexis, angustis inferioribus truncato-rotundatis, sub dorso tumore instructis. Membrana achroa, glabra. Long. 0·032 millim., lat. 0·024 millim.

Differt a *C. nitidulo*, De Notaris (Nordstedt, Desm. Ital. t. xii. f. 10) semicellulis late rotundato-trapezoideis, angulis inferioribus valde rotundatis, dorso tumore magno instructis.

34. C. HOOKERI, n. sp. (Plate V. fig. 21.) *Cosmarium* parvum, paullo longius quam latius, medio profundissime constrictum, sinu lineari, semicellulæ reniformes, a vertice visæ oblongo-ellipticæ, dorso 2–3 verrucis acute conicis munitæ. Membrana achroa, glabra.

Differt a *C. Phaseolo*, Brébisson (Ralfs's 'British Desmidiaceæ,' p. 106, t. xxxviii. f. 5), membrana glabra, semicellulis vertice oblongo-ellipticis, medio non tumidis, dorso verrucis conicis 2–3 munitis.

35. C. OLIVERI, n. sp. (Plate V. fig. 22.) *Cosmarium* parvum, tertia parte longius quam latius, ellipticum, medio profunde constrictum, sinu lineari angustissime; semicellulæ a basi recta magis magisque angustatæ, apice valde rotundatæ, lateribus leviter convexis, angulis inferioribus subrectis, a vertice visæ oblongo-ellipticæ, medio inflatæ, breviter cuspidatæ. Nuclei amylacei singuli. Membrana achroa, glabra. Long. 0·040 millim., lat. 0·031 millim.

Differt a *C. microsphincto*, Nordstedt (Desm. Ital. p. 33, t. xii.

f. 9), et a *C. microsphincto*, Nordstedt, f. *parvula*, Wille (Ferskvandsalger fra Novaja Semlja, p. 38, t. xii. f. 22), præcipue semicellulis vertice oblongo ellipticis medio breviter cuspidatis.

36. COSMARIUM PYRAMIDATUM (*Ralfs*), *Brébisson*; *De Notaris, Elementi per lo studio delle Desmidiacee Italiche*, p. 40, t. iii. f. 22. Size 0·040 × 0·030 millim.

37. C. GRANATUM, *Brébisson*; *Ralfs, British Desmidiaceæ*, p. 96, t. xxxii. f. 6. Size 0·040 × 0·030 millim.

Var. ELONGATUM, *Nordstedt, Desm. Spetsberg.* t. vi. f. 6. With zygospores. Size 0·036 × 0·024 millim.; zygospore 0·028 millim.

38. C. ABRUPTUM, *Lundell, De Desmidiaceis quæ in Suecia inventæ sunt observationes criticæ*, p. 43, t. ii. f. 22.

Forma nov. *simplex*; semicellulis verrucis centralibus destitutis. (Plate V. fig. 24.) Long. 0·019 millim., lat. 0·015 millim.

39. C. MENEGHINII (*Meneghini*), *Brébisson*; *De Bary, Conjugaten*, t. vi. f. 46. Size 0·015 × 0·011 millim.

40. C. MINUTUM, *Delponte, Specimen Desmid. Subalp.* ii. p. 105, t. vii. f. 37. Size 0·028 × 0·020 millim.

41. CLOSTERIUM CORNU, *Ehrenberg*; *Ralfs, British Desmidiaceæ*, p. 176, t. xxx. f. 6. Size 0·120 × 0·006 millim.

42. DESMIDIUM QUADRATUM (*Delponte*), *mihi*; *Delponte, Specimen Desmid. Subalp.* i. p. 63, t. iii. f. 20–23.

Var. nov. EXCAVATUM; semicellulæ vertice visæ duobus lateribus excavatis; tæniis chlorophyllaceis quattuor. (Plate V. fig. 25.) Long. cell. 0·023 millim., lat. 0·024 millim.

ZYGNEMACEÆ.

43. MOUGEOTIA sp.? The conjugated filaments of this *Mougeotia* were soaked for a few minutes in warm water. By this treatment the cell-walls of those either in conjugation or about to become so, swelled in such a manner as to occupy the cell-cavity, and compress the dry contents of the cells, the primordial utricle, the irregular chlorophyll, and imbedded starch-granules (Plate V. fig. 13). The vegetative cylindrical cells exhibited no alteration (Plate V. fig. 14).

When the filament is stained with iodine (in alcohol), it is seen that the swollen cell-wall is distinctly composed of layers; by the action of alcohol (extracting the water) the layers of the cell-wall will be contracted. We see, then, that the cell-wall is composed of three parts (Plate V. figs. 15 and 16) [excluding the common coat of the cells, the cuticle by which all the cells of the filament are uninterruptedly covered (Plate V. fig. 16 *a*)], viz., the inner and outer thickened portion (Plate V. figs. 15 *a*, *b*, and 16 *b*, *c*), and between these the exceedingly translucent and easily seen portion. By this simple method I have found a constant difference between the fertile and sterile cells of this *Mougeotia.*

Size: vegetative cells 0·020 millim., 1½–5 times as long; zygospore (Plate V. fig. 17) 0·028 × 0·036 millim.

44. SPIROGYRA MIRABILIS (*Hassall*), *Kützing*; *Petit, Spirogyra des Environs de Paris*, p. 14. t. iii. f. 4. Some zygospores are cylindrical and rounded at the ends as in *S. lutetiana*, Petit. Size: zygospore 0·084 × 0·032 millim. (1 : 2⅔).

45. S. PORTICALIS (*O. F. Müller*); *Cleve, Svenska arterna af Algfamiljen Zygnemaceæ*, p. 22, t. v. f. 13; *Petit*, l. c. p. 21, t. v. f. 9. Size: zygospore 0·056 × 0·028 millim. (1 : 2).

46. S. PUNCTATA, *Cleve, Svenska arterna af Algf. Zygnemaceæ*, p. 23, t. vi. f. 4. Size: zygospore 0·065–0·075 millim. × 0·030–0·033 millim. (1 : 2).

PALMELLACEÆ.

47. PLEUROCOCCUS MUCOSUS, *Kützing*; *Cooke, British Freshwater Algæ*, ii. p. 4, t. ii. f. 3. Size: cells 0·003 millim.

48. DACTYLOCOCCUS INFUSIONUM, *Nägeli in Gattungen einzell. Algen*, p. 85, t. iii. f. F. Size: cells 0·009 × 0·004 millim.

49. OOCYSTIS NAGELII, *Alex. Braun.* Eight-celled family. Size: family 0·036 millim.; cells 0·018 × 0·009 millim.

50. GLŒOCYSTIS VESICULOSA, *Nägeli*; *Cooke, British Freshwater Algæ*, i. p. 7, t. iii. f. 2. Size: family 0·050–0·070 millim.; cells 0·007–0·010 millim.

PROTOCOCCACEÆ.

51. PROTOCOCCUS sp.? Size: cells 0·036 millim.

52. POLYEDRIUM MINIMUM, *Alex. Braun*, *Lagerheim Bidrag till Sveriges Algflora*, p. 69, t. i. f. 27. Size: cells 0·006 millim.

53. SCENEDESMUS QUADRICAUDA (*Turpin*), *Brébisson; Schaarschmidt, Specimen phycologiæ Æquatoriensis*, p. 14.

Var. *α*. ECORNIS (*Ehrenberg*), *Ralfs, British Desmidiaceæ*, p. 190, t. xxxi. f. 12 *h*, *i*. Size: cells 0·010 × 0·002 millim.

VOLVOCACEÆ.

54. PANDORINA MORUM (*O. F. Müller*), *Bory*. Two very small eight-celled families, with 1–4 (two-four-eight-celled) daughter families. Size: family 0·035–0·040 millim.; cells 0·007–0·008 millim.

CONFERVACEÆ.

55. CONFERVA sp.? Size: cells 0·007–0·008 × 0·004 millim.

ŒDOGONIACEÆ.

56. ŒDOGONIUM LONGICOLLE, *Nordstedt, Algæ aquæ dulc. et Charac. Sandvic.* p. 20, t. ii. f. 11–12.

Var. SENEGALENSE, *Nordstedt, De Algis nonnullis Mus. Lugd. Bat.* p. 13, t. i. f. 23.

Forma nov. *afghanicum*; oogoniis 2–7 continuis. (Plate V. fig. 27.) Size: vegetative cells 0·007–0·008 millim., three times as long; oogonia 0·022 × 0·024 millim.; oospore 0·021 × 0·019 millim.

57. Œ. PRINGSHEIMII, *Cramer*; *Cooke, British Freshwater Algæ*, v. p. 166, t. lxiii. f. 2. Size: female cells 0·030 millim. 2–2½ times as long; male cells 0·023 millim., 2–2½ times as long; oogonia 0·045–0·065 millim.; oospore 0·038–0·049 millim.

58. BULBOCHÆTE PYGMÆA, *Pringsheim in Jahrbücher f. wiss. Bot.* i. 1. (1857), p. 74, t. vi. f. 10. Size: cells 0·016 millim. by twice as long; oogonia 0·024 × 0·044 millim.

COLEOCHÆTACEÆ.

59. COLEOCHÆTE SCUTATA, *Brébisson, Pringsheim Jahrbücher f. wiss. Bot.* ii. 1. (1860), p. 35, t. iii. f. 3. With corticated and matured carpogonia. Size: plant 0·050–0·160 × 0·060–0·200 millim.; carpogonia 0·070 × 0·080 millim.; cells 0·015 millim. by 1–2 times as long.

CHARACEÆ.

60. CHARA sp. Chlorophyll-granules in division. Fragments only, not sufficient for identification of the species. For the

description of the chlorophyll-granules, *cfr.* Schaarschmidt's "Researches on the Division of the Chlorophyll-granules, and upon the Occurrence of Hypochlorin in the Cyanophyceæ and Bacillariaceæ," Nature, xxvi. 1882, No. 672, pp. 476–477.

DESCRIPTION OF PLATE V.

Fig. 1. *Microcoleus Aitchisonii*, n. sp. × 1500.
2. *Anabæna* (*Cylindrospermum*), filament, cells in division. × 1000.
3 & 4. Conferva-like filaments. × 1000.
5. Filament, with swelled yellowish cell-wall. × 1000.
6. Thicker-coated filaments. × 1000.
7. The cells at the end of the filament (of *a*) separating. × 1000.
8. The separated cells remaining close together and forming a *Synechococcus*-like family. × 1000.
9. *Chroococcus*-like cells, which are derived from the filaments, fig. 6. × 1000.
10. *Glœothece*-like cells, springing from the former (fig. 9) cells by division. × 1000.
11. *Stauroneis acuta*, Ehrenberg, n. f. *tenuis*. × 400.
12. *S. anceps*, Ehrenberg, n. f. *tenuicollis*. × 870.
13. *Mougeotia* sp.? Cells in conjugation, soaked for a few minutes in warm water. The cell-walls of the conjugated or cells ready for conjugation swollen so as to fill out the inner cavity of the cells. × 600.
14. The vegetative cells remain unaltered. × 600.
15–16. The cells after treatment with warm water stained with iodine (in alcohol); the cell-wall is, as seen, composed of layers. Two of the layers (the outer and the inner) are thicker (fig. 15 *a*, *b*; fig. 16 *b*, *c*). The cuticula (fig. 16 *a*) is the common coat of the cells. × 600.
17. Matured zygospore. × 600.
18. *Euastrum spinulosum*, Delponte, **inermis*, Nordstedt, n. var. *Oliveri*. × 600.
19. *Cosmarium Botrytis* (Bory), Meneghini, n. var. *afghanicum*. × 600.
20. —— *Aitchisonii*, n. sp. × 760.
21. —— *Hookeri*, n. sp. × 760.
22. —— *Oliveri*, n. sp. ×600.
23. —— *undulatum*, Corda, n. var. *ornatum*. × 760.
24. —— *abruptum*, Lundell, n. f. *simplex*. × 1000.
25. *Desmidium quadratum* (Delponte), n. var. *excavatum*. End view, × 600.
26. *Œdogonium longicolle*, Nordstedt, var. *senegalense*, Nordstedt, n. f. *afghanicum*. × 870.

On some Pollen from Funereal Garlands found in an Egyptian Tomb, *circa* B.C. 1000. By CHARLES FREDERICK WHITE, F.L.S.

[Read 3rd April, 1884.]

(PLATE VI.)

THESE drawings of the pollen of *Papaver Rhœas* I have been enabled to make by the kindness of Sir Joseph Hooker, who procured for me a few anthers from the funereal garlands from the coffin of the Princess Nzi Khonson, of the XXI. Dynasty, about B.C. 1000, from Egypt, of which several were lately exhibited here by Mr. Dyer. And on the same sheet I have added copies of previous drawings from recent gatherings of the plant. The former are generally slightly larger, and somewhat more tapering towards the ends; the anthers also are larger. These latter are hard and brittle, and of a blackish-red colour, as though charred. Perhaps there is no family in which the size of the pollen-grain varies more than in that of the Papaveraceæ, nor in which the proportionate number of aborted or malformed grains is greater. And this character appears to belong to the ancient as well as to the modern. Still the grains of normal size and shape are not only larger, but more regular in their markings,—certainly cleaner and brighter in colour than some that I have endeavoured to preserve on slides for the microscope, collected only a few years ago.

The point, however, to which I desire especially to call attention is the readiness with which these minute objects (presumably deprived of all moisture for so long a period) absorb water, and expand into that subspherical shape so usual with pollen of simple form, with the peculiarity that the Egyptian assume the ***three-lobed*** shape common to many pollens, the furrows becoming deeper than when dry, instead of, as generally happens, being nearly obliterated when placed in water.

No indication of the appearance of the pollen-tubes can be detected, excepting that in several grains I observed at one of the three points at which they would be produced a small bubble of air. I may mention that the characters of the spiral tissue of the inner lining of the anther can be, when in water, sufficiently made out.

DESCRIPTION OF PLATE VI.

Fig. 1. Pollen-grains of the Poppy (*Papaver Rhœas*) from the coffin of the Egyptian Princess Nzi Khonson, XXI. Dynasty, B.C. 1000. × 500.

2. Some of the same, immersed in water. × 500.
3. The recent pollen-grains of *P. Rhœas*. × 500.
4. Some recent pollen-grains immersed in water. × 500.
5. An anther of the Poppy from the coffin (B.C. 1000) above mentioned. ×50.
6. An anther from a Poppy grown in 1883. ×50.

Notes on the Flora of Parasnath, a Mountain of North-western Bengal, in a Letter from C. B. Clarke, F.R.S., F.L.S., to, and with an Introductory Note by, Sir J. D. Hooker, K.C.S.I., F.R.S.

[Read 19th June, 1884.]

[The mountain, to the vegetation of which the following pages are devoted, is one of the most interesting in trans-Gangetic India from its isolation and position. It stands on the north-eastern extreme of the elevated region which forms the high land of the Deccan, and is prolonged northward to the bend of the Ganges; from which the descent is abrupt to the plains of the Gangetic valley, which again extend northward uninterruptedly to the foot of the Himalaya.

The latitude of Parasnath is nearly 24° N.; longitude 86° 6′ E.; its distance from Calcutta is 122 miles in a north-eastern direction, and it is 88 miles distant from the Ganges north of it. Its height is about 4500 feet.

The vegetation of Parasnath is that of the Deccan, with a slight admixture of Himalayan and Malayan types. Of the former of these there are fewer than might have been anticipated from its elevation and position, but not fewer than may well be accounted for by the heat and dryness of the surrounding country.

The first described ascent made of Parasnath was, as far as I am aware, my own in February 1848, as narrated in the Journal of the Asiatic Society of Bengal (vol. xvii. pt. 2, p. 355), and subsequently in my Himalayan Journals (Ed. i. vol. i. p. 18), when I collected or observed about 300 species of plants. Its botany has since been investigated successively by Drs. Thomson, Anderson, and King, when Superintendents of the Calcutta Botanical Gardens, but no complete account of its flora has been published.—J. D. Hooker.]

Hazaribagh, Oct. 12th, 1883.

My dear Sir J. D. Hooker,

I ascended Parasnath on 6th October; and you may be interested to get some modern news of a mountain which you first made known to the European scientific public. The road you made the ascent by is still sound, but covered with tall grasses and disused. There is a railway station now only 20 miles from Mudobun at the northern base of the mountain; and from Mudobun to the summit there is a road (6 miles) which you could drive up in a hansom. Along the north base of the mountain is a tea-plantation; but Parasnath itself is not, I think, likely to be encroached on by planters for many years to come, nor has it yet been injured botanically by visitors. As my visit was a short one, I did not attempt to make a general collection of plants: I confined myself mostly to the Monocotyledons, the *Glumaceæ* in particular; but there are some Dicotyledons which, though well known, it is hardly possible to keep one's hands off, such as the *Begonia*, the *Sonerila*, the *Exacum*, all abundant. There is only one plant on Parasnath which I cannot get elsewhere (so far as I know), the pink *Knoxia brachycarpa*, R. Br., which you got here, and which is, I believe, more plentiful in Burma; I collected a stock of it, and find it produces a very thick woody root, bright yellow when cut across. I collected (which I had not got before on Parasnath) the common orange-tipped *Æschynanthus*; and the leaves only of a very large *Hoya*. I got up into two trees but could find neither flower nor any remains of fruit: I suppose it flowers in April. On the central summit (which is 200 feet lower than the western, *i. e.* is 4300 feet about) there is left a cluster of the problematical *Phœnix* (*acaulis* ?): I measured the stem of one, which is 14 feet from the ground to the lowest leaf, and nearly uniformly 34 inches in circumference for its whole length: there are other stems 8–10 feet long. I endeavoured to collect a good set of the large Grasses along the ridge—*Cymbopogon*, *Anthistiria*, *Pollinia*, &c. Living on these I found (not a tree-frog but) a grass-frog; a very slaty-dirt coloured species. When I coaxed him downwards he seemed to have a horror of *terra firma*; he jumped about on the *Anthistirias*, holding the culm with his two fore feet, and swinging on them like a bird on a twig. In this season the summit of Parasnath had not one drop of dew in the morning, while at 3000 feet the dew was plentiful: this difference, as well as the difference in altitude, will account for the number of plants that grow along the crest of Parasnath but will not descend. I found a *Carex* I never got here before—a very slender culm, with 1–2 remote female grass-green spikes; it is very nearly (or quite) the same as the low-level *Carex* which grows in the Teesta gorge in Sikkim. I kept my eye on the Gingers, as they are numerous in species, and abundant in individuals here. The large *Amomum* was in full flower at 4100 feet, with leaves 5 feet long and more (the lamina 32 by 11 inches), the flower-spikes very large, white, the rhizome gamboge-yellow when cut across. It is a very striking plant; but, comparing it with the medium-sized common white *Amomum* of the 1500-feet level, I could find no specific difference. The *Hedychium* common here is now (October) very shabby, but is throwing up young stems to flower next April. These are very red, with the young leaves red and scale-like, and so exceedingly like the flowering (leafless) stems of the *Zingiber* that (the two plants growing mixed) it is difficult, without taking the plant in the hand, to say whether you have got a young stem of *Hedychium* or a leafless flower-stem of Ginger. Is the leafless flower-stem of Ginger really only an ordinary stem gradually forced abnormally early into flower by a secular change in climate? There was a fine *Elettaria* in fruit, which is nearly or quite the same as the one that grows at Khursiong in Sikkim. I saw three ground Orchises in fruit: I have never seen on Parasnath any epiphytic Orchis; the air seems too dry, though there is *Vanda* in abundance on the Mohwa trees (*Bassia*) at the base, as you found it. In spite of the dryness, there are a good many Ferns even near the summit. *Asplenium* (*Drepanophyllum* is the name) abounds, while the nearly allied common *A.* (*Athyrium*) *macrocarpum* is absent. Parasnath is the north-east limit of the *A.* (*Drepanophyllum*) *Hohenackerianum*, which is, I believe, abundant in Central India. I also collected several specimens of *Ophioglossum vulgatum*: I say *vulgatum*, relying on Luerssen, who has (I doubt not correctly) run a number of Ophioglossums into that species. The Indian Ophioglossums are not less interesting considered as forms than considered as species: this Parasnath form is, however, much more like the common English *Ophioglossum* than either the Sikkim or Levinge's Kashnior one.

It is 15 years ago since I first ascended Parasnath, and I see wonderfully little difference in the vegetation: there are the same plants, in the same relative degrees of abundance, and I can hardly pick out one that I can say has either advanced or retreated 100 yards, so nicely are the forces balanced. There is the Thalictrum, the Geranium, the Barberry, the Senecio, &c., on the ridge exactly where you found them, and, as of old, the giant scandent *Bauhinia* ascending a few feet higher than any of them.

The Himalayas and Khasia rather spoil one for a small thing like Parasnath; but Parasnath is really very rich; the number of trees that flourish at or above 4000 feet is remarkable, and some of them, as *Grewia asiatica*, appear to grow higher up at this elevation than elsewhere. I noticed that *Heptapleuron* commences its life here as a scandent epiphyte, but subsequently reaching the ground, it grows to a large size as a tree, and shows no sign of its early history. Other Araliads do this in Sikkim, thus imitating *Wightia* and several of the Figs.

I attempted photographs on Parasnath, but I had only some gelatine plates that have been through the rains at Calcutta, and I cannot tell how they may develop, possibly not at all.

By the north railway Darjeeling is now so quickly and easily reached that all the pressure of Calcutta visitors is taken off Parasnath, which is chiefly visited from the neighbourhood. The coal-mines here give employment to a large English population, and the East-Indian Railway has some of its largest works not far off, so that the Bungalow at 4200 feet is still used: indeed I met a lady who went up for the whole hot weather, nearly two months. The air is perfect on Parasnath, and the change sufficient for the Englishman from the plains who, if he goes to 7000 feet at Darjeeling, may there get "chill," or "fever," or "hill-dysentery." Parasnath is perfectly healthy; and the succession of visitors still bless Sir G. Campbell, who purchased the bungalow (very cheaply) with the express purpose that Europeans might recruit there.

I collected at about 2500 feet alt., on Parasnath, the remarkable Rice we know (perhaps wrongly) as *Oryza coarctata*, Roxb. It has the hard, horny, almost woody root, and the broad plicate ribbed leaves that so many of the rocky-wood inhabiting grasses possess; but the flowers and fruit are completely *Oryza*. Indeed the natives tell me that it is a high-class food-rice, and that though so scanty and troublesome to collect, they sometimes set their children to collect a little, as exceptionally good in quality.

Yours very truly,
C. B. Clarke.

On *Hyalocalyx*, a new Genus of Turneraceæ from Madagascar. By R. A. Rolfe, Herbarium, Royal Gardens, Kew. (Communicated by Prof. D. Oliver, F.R.S., F.L.S.)

[Read 17th April, 1884.]

(Plate VII.)

The Order Turneraceæ has recently formed the subject of an excellent monograph by Dr. Ignatius Urban, of Berlin. In this monograph he has shown that the Order consists of 83 species belonging to five genera. Of these *Turnera* has 54 species, all American, and ranging from Mexico to the Argentine republic; *Wormskioldia* with 7 species, and *Streptopetalum* with 2, are confined to Africa, where they range from Abyssinia to Mozambique; 2 species of the former genus being confined to the small island of Zanzibar; the remarkable monotypic genus *Mathurina* is peculiar to the island of Rodriguez; while *Piriqueta* has 19 species, of which 16 are American, and ranging from North Carolina to the Argentine Republic, one is confined to a limited region at the Cape of Good Hope, and the remaining two are limited to North Madagascar. An additional genus may now be added from the small island of Nossi-bé, on the north-west of Madagascar. I am indebted to Dr. Vatke, of Berlin, for the opportunity of examining and describing this plant, which was collected by the late Dr. Christian Rutenberg, and is preserved in the Herbarium at Bremen. A careful and leisurely examination of this plant has shown one or two peculiar characters which seem to require a new genus for its reception. I have therefore made a drawing of it, which, with the accompanying description, I have pleasure in offering to the Linnean Society.

Following Urban's arrangement, the position of this genus is between *Mathurina* and *Turnera*, with both of which it agrees in the absence of a corona at the base of the petals. In habit it is very similar to *Turnera*, being a small herb with erect flowers, which are solitary in the axils of the leaves; the styles, seeds, and arillus are also very similar. The only approach to *Mathurina* is in the subhypogynous insertion of the petals and stamens. The flower (as far as I know) is by far the smallest in the Order, as it is only two lines long and very slender; it is also peculiar in having a number of long white hairs on the peduncle.

The calyx is, perhaps, its most remarkable character, and it was only by careful dissection in water that I was able to understand it. The name I propose explains its peculiarity; instead of the usual herbaceous calyx, we have a membranous one, hyaline, and without chlorophyll; it is tubular, cleft to the middle into five, quincuncially arranged, concave oblong segments, close to the apex of which are two diverging setæ, quite a fourth of the calyx in length, and bent back from it at an angle of 45°. There are three faint nerves on each segment to the base of the calyx, at which point the petals and stamens are inserted (as shown in the drawing). The ovary contains nine ovules, three on each placenta, and apparently arranged in a single series; the number may not be constant, and a few of the ovules do not develop. The fruit is altogether anomalous in the Order: after the flower withers the short peduncle elongates considerably; but the side nearest to the branch grows more rapidly than the opposite one, and the capsule becomes inverted, and closely appressed to the curved peduncle (fig. 10), the long white bristles giving it a singular appearance.

The absence of chlorophyll in the calyx, and its hyaline character, seem to be very easily accounted for. The flowers occur at the ends of the branches, where the leaves are much congested and sessile; these upper leaves are clothed at the base with a quantity of long whitish hairs, amongst which the minute flowers are developed. The light is evidently prevented from reaching them in this position, so much so that the green colour is absent in the bases of these upper leaves. It is probable that the elongation of the peduncle after flowering is an attempt on the part of the plant to bring the fruit under the full influence of the light, and thus assist its development. It would be interesting to watch this development under cultivation.

Hyalocalyx, gen. nov.

Sepala ad medium in tubum subcylindraceum coalita, tenuissime hyalino-membranacea, inconspicue trinervia, quincuncialiter imbricata, apice bisetifera. Petala ima basi calycis inserta sed vere perigyna, inferne cuneata, nuda. Stamina perigyna, ima basi calycis inserta; filamenta linearia, basi dilatata; antheræ breves, cordato-ovoideæ, apice leviter mucronulatæ. Ovarium ovoideum, glabrum; styli 3, recti, filiformi, glabri, apice breviter flabellatim

multiparti; placentæ 3, 3-ovulatæ, ovulis uniseriatis, funiculis longiusculis insertæ. Pedunculus fructiferus auctus, apice arcte incurvato. Fructus invertus, lævis, pæne ad basin dehiscens. Semina oblongo-obovoidea, in hilum subito contracta, curvata; testa reticulato-striata, striis elevatis; arillus unilateralis semen dimidium æquans, tenuiter membranaceus margine integro.

H. SETIFERUS, sp. unica.—Herba parva, ramosa; rami tereti, hirsuti, pilis simplicibus adpressis. Folia alterna, inferne sparsa, ad apices ramorum conferta, breviter petiolata, elliptica v. lanceolato-elliptica, acutiuscula, crenato-serrulata, basi attenuata, integra, eglandulosa, utrinque strigoso-hirsuta. Flores solitarii in axillis foliorum congestorum ad apices ramorum, erecti, breviter pedunculati, 2 lin. longi; pedunculo dense setoso pilis albidis. Fructus 1½ lin. longus, pedunculo fructifero 2½ lin. longo.

In insula Nossi-bé, Madagascariensis; *Rutenberg*!

DESCRIPTION OF PLATE VII.

Hyalocalyx setiferus, Rolfe, nov. gen. et sp.

Fig. 1. Branch, of natural size.
2. Unexpanded flower; showing the short setose flowering peduncle and the peculiar setiform calycine appendages, × 4 diam.
3. Bract removed, × 2 diam.
4. Part of expanded flower; showing the position and relative lengths of the parts (two of the stamens in each flower are a little longer than the other three, but a little shorter than the styles *); × 4 diam.
5. The delicate hyaline membranous calyx laid open; showing the apical appendages and the insertion of the petals (*a*), and stamens (*b*), × 8 diam.
6. Petal, × 8 diam.
7. Stamen, × 16 diam.
8. Ovary and styles, × 16 diam.
9. Ovule with funiculus, × 16 diam.
10. Fruit, showing the elongated curved setose fruiting peduncle with inverted capsule, × 8 diam.
11. Capsule after dehiscence, showing the placentas and insertion of the seeds, × 4 diam.
12. Seed, showing the reticulate-striate testa and the unilateral membranous arillus, × 8 diam.

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* The species will probably prove to be dimorphous, like many others in the Order: in this case our specimen will represent the long-styled form.

On the Algo-Lichen Hypothesis.

By the Rev. James M. Crombie, F.L.S.

[Read 12th April, 1884.]

(Plates VIII. & IX.)

I need scarcely say that one of the most interesting biological problems of the day, in so far at least as relates to Vegetable Morphology and Physiology, is connected with the theory usually known under this appellation, or, as it might more correctly be called, the Algo-Fungal-Lichen hypothesis. This is sufficiently proved by the now very extensive literature of the subject and by the various discussions to which it has given rise. To give any detailed *résumé* of that literature, or to enter minutely into these discussions, is as foreign to my present purpose as it is unnecessary for the elucidation of the subject. It will suffice that I bring under your notice, as succinctly as is consistent with a due understanding of the question, the presumed grounds on which the hypothesis rests and the ascertained facts by which it is subverted.

Now the problem to be solved is—What is the origin of the lichen-gonidia, and in what relation do they stand to the thallus? In premicroscopical days, as might be expected from the nature of the case, nothing on these points was either known or written. Indeed, by the earlier lichenists the gonidia were scarcely, if at all, distinguished; and it was not until 1825 that they were first distinctly recognized by Wallroth ('Naturgeschichte der Flechten'), who supposed that they were the asexual reproductive organs of Lichens, and so gave them their distinctive appellation. Even in Koerber's Dissertation "De Gonidiis Lichenum" (1839), in which they are treated more fully and accurately than in any previous work, nothing is adduced as to their genesis or their relation (except in the case of soredia) to the other elements of the thallus. The first who gave any explanation of the matter was Bayrhoffer, who, in 1851 ('Einiges über die Lichenen und deren Befruchtung') stated that "the threads of the fibrous stratum" swell at the top, which swellings afterwards become "male gonidia." This was subsequently confirmed by Speerschneider (Bot. Zeit. 1853 &c.), and supported (with a slight modification) by Schwendener (in Nägeli, Beiträge zur Wissen. Bot. ii. 1859, p. 125, t. i. fig. 18, t. v. fig. 6), as also by De Bary ('Morphologie und Physiologie der Pilze Flechten,' &c., 1865). According to this theory the gonidia originate from the hyphæ in the manner succinctly described by Th. M. Fries, in Scand. (p. 7), who embraces and defends it as the result of his own observations. "The hyphæ," he says, "are not only elongated into filaments, but they also put forth short branchlets. The terminal cell of such branchlet is gradually dilated, becomes subglobose, and is at length filled with chlorophyll (or a subsimilar coloured matter); in a few that cellule is changed into a gonidium, and then, variously divided, originates other gonidia."

This view of the genesis of the gonidia from the hyphæ, which was quite erroneous, was for some time generally accepted without further inquiry; although, as we shall afterwards see, there were certain other and different observations made previously to those of Speerschneider, which were either entirely overlooked or not rightly understood. In 1868, however, Prof. Schwendener, reviewing the original notion on this subject, towards the end of a paper entitled "Untersuchungen über den Flechtenthallus," and more especially in a subsequent treatise, 'Die Algen-typen der Flechten Gonidia' (1869), rightly affirms that the actual development of a gonidium from the terminal cell of a hypha had not with certainty been observed, but only assumed by authors. Accordingly he enunciated an entirely new theory on the subject, which was evidently based upon a suggestion previously made by De Bary. This latter celebrated cryptogamist, in his paper already referred to (p. 291), observing the resemblance between the gonidia of some Collemacei and certain of the lower Algæ, came to the following conclusion:—"Either the Lichens in question," he says, "are the perfectly developed states of plants whose imperfectly developed forms have hitherto stood amongst Algæ as Nostocaceæ and Chroococcaceæ, or the Nostocaceæ and the Chroococcaceæ are typical Algæ which assume the form of *Collema*, *Ephebe*, &c., through certain parasitic Ascomycetes penetrating into them, spreading their mycelia into the continuously growing thallus, and frequently becoming attached to their phycochrome-bearing cells."

Taking the latter of these alternatives as his starting-point, Schwendener, commencing with the Collemacei, made various observations and experiments, which were afterwards extended to other tribes and genera, the result of which led him to the conclusion that the lichen-gonidia are unicellular or filamentose Algæ, and the lichen-thallus a parasitic Fungus. The various Algal types which he regards as constituting the gonidia he includes under two groups, viz. the "Phycochromaceæ" and the "Chlorophyllaceæ," so called from the colour of their respective cell-contents. To the former group, that with bluish-green cellules, he assigned five Algal types, viz.:—1. Sirosiphoneæ; 2. Rivulariæ; 3. Scytonemeæ; 4. Nostochaceæ; 5. Chroococcaceæ: and to the latter group, that with chlorophyll-green cellules, he assigns three Algal types, viz.:—6. Confervaceæ; 7. Chroolepideæ; 8. Palmellaceæ. Moreover, failing in his researches to observe any genetic connexion between the hyphæ and the gonidia, and unable otherwise to account for the presence of the gonidia in the lichen-thallus, he propounded the theory now so well known as the "Schwendenerian hypothesis." This, briefly stated in his own words, is as follows:—"As the result of my researches," he says, "all these (lichen) growths are not simple plants—not individuals in the usual sense of the term; they are rather colonies, which consist of hundreds and thousands of individuals, of which, however, only one acts as master, while the others, in perpetual captivity, provide nourishment for themselves and their master. This master is a fungus of the order Ascomycetes, a parasite which is accustomed to live upon the work of others; its slaves are green algals, which it has sought out or indeed caught hold of, and forced into its service. It surrounds them, as a spider does its prey, with a fibrous net of narrow meshes, which is gradually converted into an impenetrable covering. While, however, the spider sucks its prey and leaves it lying dead, the fungus incites the Algæ taken in its web to more rapid activity, nay, to more vigorous increase." In the conclusion of the latter paper of Schwendener, above cited, he argues that the algal nature of the lichen-gonidia, which he maintains has been established in the cases he has reviewed, is extremely probable also in every other case, and that consequently the gonidium is not, as previously supposed, a self-developed organ of the lichen. But though not thus to be regarded, gonidia, he says, would still, in a physiological point of view, remain as instruments of assimilation and of asexual increase. For, although they have not the power in themselves to form a thallus, they are an essential constituent of it, and are undeniably the most important, though not the only, ministers of nutrition to the composite plant called a "lichen," inasmuch as this also is partly furnished by means of the substratum.

Passing over two other and subsequent papers of Schwendener, viz. "Erörterungen zur Gonidienfrage" (in 'Flora,' 1872) and "Die Flechten als Parasiten der Algen" (in Verhandl. der Naturf. Gesellschaft in Basel, 1873), in which, after replying to several objections that had been adduced by Krempelhuber* and Th. M. Fries, he maintains and further illustrates the hypothesis, though without adducing any absolutely new arguments, we now come to notice the contributions made to the theory by Dr. E. Bornet, in some respects the ablest and most plausible of its advocates. In a memoir entitled "Recherches sur les Gonidies des Lichens" (in Ann. des Sci. Nat. 5^{e} sér. t. xvii., 1873), he accepts in its full extent Schwendener's theory as the only one capable of explaining satisfactorily many obscure phenomena in the morphology and physiology of Lichens. After pointing out that Schwendener did not sufficiently show that the relations between the hyphæ and the gonidia were such as necessarily to involve the idea of parasitism, and arguing that the great similarity between the gonidia of Lichens and certain Algal types was not an accidental circumstance, he passes in review an extensive series of Lichens belonging to numerous different genera. Adopting the two Algal groups of Schwendener, already referred to, he examines first the Chlorophyllaceæ, viz. *Trentepohlia*, Mart., *Phyllactidium*, Kütz., *Protococcus*, Ag. Of these he traces the resemblance between *Trentepohlia* and lichen-gonidia in thirteen genera, viz.:—(1) *Roccella*, as already shown by Schwendener; (2) *Lecanora*, in many species; (3) *Dirina repanda*, Fr.; (4) *Cœnogonium Linkii*, Ehrh., and *C. confervoides*, Nyl.; (5) *Byssocaulon niveum*, Mont.; (6) *Lecidea lutea* (Dicks.), and *L. microsperma*, Nyl.; (7) *Graphis elegans*, Ach.; *G. contexta*, Pers., and *G. heterospora*, Nyl.; (8) *Opegrapha varia*, Pers., and *O. herbarum*, Mont.; (9) *Stigmatidium crassum*, Dub.; (10) *Arthonia cinnabarina*, Wallr.; (11) *Melaspilea arthonioides* (Fée); (12) *Chiodecton myrticola*, Fée, and *C. nigrocinctum*, Mont.; (13) *Verrucaria nitida*, Schrad., in which, as well as in several Graphidei, it had formerly been recognized by De Bary. The genus *Phyllactidium* he regards as furnishing the gonidia to *Opegrapha filicina*, Mont.; while a species of *Protococcus*, viz. *P. viridis*, is similar to the gonidia of *Physcia parietina.* Similarly he reviews Schwendener's other group, the Phycochromaceæ, and finds the following genera belonging to it furnishing gonidia to various genera and species of Lichens:—(1) *Calothrix*, Ag., to *Lichina*, Ag.; (2) *Scytonema*, Ag., to *Ephebella Hegetschweileri*, Itz., to the cephalodia of *Stereocaulon ramulosum*, Sw., and to various *Pannariæ*; (3) *Lyngbya*, Ag., to *Stereocaulon ramulosum*, Sw.; (4) *Nostoc*, Vauch., to *Collema, Arnoldia, Physma, Leptogium, Obryzum*, the cephalodia of some *Stereocaula, Nephromium, Stictina*, and certain *Pannariæ*; (5) *Stigonema*, Ag., to *Lichenosphæria Lenormandi*, Born., *Spilonema paradoxum*, Born., *Ephebe pubescens* (L.), and the cephalodia of *Stereocaulon furcatum*, Fr.; (6) *Glæocapsa*, Kütz., to *Synalissa, Omphalaria, Phylliscum* (as formerly shown by Schwendener), *Cora*, and certain cephalodia of *Stereocaulon.*

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* In 'Geschichte und Litteratur der Lichenologie,' iii. Bd. (1872).

Of these Algals, as observed by Bornet, a small number of species furnish the gonidia for a great many different species and even genera of Lichens. As to the relation between these and the hyphæ, he affirms that there is not the least evidence that the gonidia originate from the hyphæ any more than the hyphæ from the gonidia; but that, on the contrary, the two are originally quite independent, and that their union is a subsequent event. This union, he acknowledges, is difficult to be seen in the higher Lichens; but in several of those enumerated above, and reviewed by him, he has been able to detect the manner of adhesion. For, while in the great majority of Lichens the hyphæ envelop the Algals and form a more or less embracing network around them, yet in some instances, according to his observations, the union is something more than mere contact, being a penetrating by the hyphæ into the interior of the algal-cells. In such instances of penetration, *e. g.* in *Arnoldia minutula*, Born., the cell, he says, becomes enlarged, the wall thickens, the contents become colourless; at length the wall shrivels up, and the gonidium finally becomes a dead membrane. Various other minor points as to the relation between the hyphæ and the gonidia are touched upon by Bornet, which it is not necessary to enter upon for our present purpose. Suffice it to say that, as the general result of his investigations, he concludes that he is fully warranted in laying down the two following propositions. 1. Every gonidium of a lichen may be referred to a species of algal. 2. The connexion of the hyphæ with the gonidia is of such a nature as to exclude all possibility of the one organ being produced by the other, and the theory of parasitism can alone explain it satisfactorily. It is in this way only, he maintains, that we can account for the gonidia of very diverse Lichens being almost identical, as well as for the marked differences between the gonidia of other Lichens, of which the thallus and fructification are identical. Thus, also, he thinks, can only be rightly explained the origin of dead gonidia found in the interior of Lichens, as well as the occurrence in the same thallus of dissimilarly coloured gonidia.

But not to dwell further, at present, upon the conclusions at which, upon these and similar grounds, the supporters of Schwendenerism have arrived, we proceed to notice what would naturally suggest itself as being a very simple solution of the problem. At first sight it might seem that the connexion between the hyphæ and the gonidia (if any such existed) could readily be proved by cultivating lichens from their spores, and tracing the subsequent evolution of the thallus at every stage of growth. If the gonidia were proper organs of the lichen, we should thus be able to observe when and how they first made their appearance; but if, on the contrary, they were foreign bodies, then evidently they would nowhere present themselves in the thallus thus obtained. Indeed Schwendener himself (in 'Die Algentypen,' &c.) rightly observes that the question cannot be settled by hypotheses or isolated one-sided observations, but, as De Bary had previously advised, by numerous and carefully conducted experiments in the culture of lichen-spores, lichen-gonidia, and unicellular Algæ. In this way only, he says, can it be definitely established whether the germinating lichen-spore develops gonidia or not, and whether such free gonidia-groups as he takes to be algals can form from themselves a hypha-bearing thallus or not. Accordingly, to say nothing of earlier attempts, numerous others have been made since the promulgation of Schwendenerism, in the way of lichen-cultivation. Most of the experiments thus instituted, as will presently appear, proceeded upon an erroneous principle; while all of them confessedly failed in producing gonidia and much less a perfect thallus. The only legitimate cultures made were those of Treub ('Onderzoekingen over de Natuur der Lichenen,' 1873), in so far at least as these relate to the spores of certain species of *Physcia*, *Ramalina*, and *Lecanora*, which, in the manner long before indicated by Tulasne, were sown upon various moistened substrata. Nay, not contented with leaving these to develop in a natural way, Treub, on their germinating further, tried to cultivate them by the aid of various nutrient fluids *. After protracted experiments, however, he acknowledges that the results obtained were in all cases very unsatisfactory, owing to the spores not rightly germinating, or to the presence of moulds, or to the hyphal filaments not becoming fully developed. This has also been the experience of myself, and no doubt of many others who have attempted spore-cultivation (*cfr.* Nylander "On the Germination of the Spores of *Varicellaria,*" in 'Flora,' 1868). Indeed, except under the same conditions of exposure to atmospheric and other influences as those under which they grow in nature, it is not possible to cultivate lichens beyond the earliest stages of evolution †. Their vital phenomena being very intermittent, and unlike that of all other plants—now dormant in dry weather, now active in wet,—their subsequent growth, in consequence of this twofold life, is extremely slow, and the formation of the perfect plant in most cases a long-protracted process. Hence spore-cultures carried on at home, where the conditions referred to cannot be obtained, can hardly lead to any very definite or final results. And this, owing not to any want of co-operation of the requisite algals, as alleged by Schwendenerians, but to the "extreme impatience of situation and air which is inherent in the different species; whence it follows that these vegetables immediately perish, where the natal situation and necessary access of air is disturbed" (Nyl., in Pyr. Or. p. 31).

But another method of culture has been adopted by Schwendenerians, who, by the process called *Synthesis,* or rather *Symbiosis* (as it has been termed by De Bary), have made various attempts to manufacture lichens by sowing their spores upon certain algals, or presumed algals. Thus, amongst other experiments of this kind, Rees sowed the spores of *Collema glaucescens* upon *Nostoc lichenoides* (*vide* Monatsb. K. Akad. der Wissensch. zu Berlin, 1871); Bornet sowed the spores of *Physcia parietina* upon *Protococcus viridis* *, and those of *Lecidea muscorum* upon another species of *Protococcus* (*vide* Recherch. sur les Gonidies, &c.); while Treub sowed the spores of *Physcia*, *Ramalina*, and *Lecanora* upon *Cystococcus humicola* (*vide* Memoir already cited, pt. ii.). All these experiments, however, met with but a very limited amount of success, just as in the case of spore-culture by itself without any added "algals." Even where the spores successfully germinated and produced hyphæ, all that could be affirmed was that these formed with the Algæ a structure resembling in some degree the more or less rudimentary thallus of a lichen. But it is to be observed with respect to these synthetical cultures, and all other experiments of a similar kind, that even were the results more pronounced than they have been, they would prove absolutely nothing as to the truth of the hypothesis. The lichen-spore must, from its very nature, produce lichen-hyphæ, whether with or without the addition of algals or pseudo-algals; though what the fate of true added Algæ in the subsequent evolution of the thallus might be, the experiments in *Symbiosis* do not show. A very singular synthetical experiment was made by Dr. Stahl (*vide* Beitr. zur Entwick.-Gesch. Flechten, 1877, Heft ii., "Ueber die Bedeutung der Hymenialgonidien"), which has been imagined in some quarters to supply "the missing link" in the chain of evidence by which the Schwendenerian hypothesis can be demonstrated †. He cultivated the spores of a lichen which he called *Endocarpon pusillum*, Hedw. (but which evidently was *Verrucaria Garovaglii*, Mont.), along with the hymenial gonidia (more correctly *gonidimia*) which adhered to or surrounded the spores ‡. Each spore sent forth from its

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* These nutrient fluids were such as had been used by Boussingault for the development of the *Mycoderms* and by Pasteur for that of the *Mucidinæ.* No wonder "that the results were very small," since the nutriment of Fungi and of Lichens is totally different in its nature!

† Of all recorded experiments in this direction, none have been more, and few as, successful as those of Tulasne (*vide* 'Mémoire sur les Lichens,' 1852).

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* That this *Protococcus* constituted the gonidia of *Physcia parietina* had long previously been suggested by Kützing (*vide* Phyc. Gen. 1843, p. 167); but, as I have elsewhere shown, it is a true algal, and has only a superficial resemblance to any lichen-gonidia (*vide* Pop. Sc. Rev. 1874, p. 271, t. 112. ff. 3, 4).

† For a detailed and crushing reply to Stahl's observations and conclusions, *vid.* Richard's valuable treatise, 'Etude sur les substratums des Lichens' (1883), pp. 6–13.

‡ These hymenial gonidimia have an "intraconceptacular origin" (*vide* Nyl. in Flora, 1877, p. 357), evidently originating from the parietal cellules of the pyrenium in which they arise before the thecæ. Consequently they do not find their way in after the formation of the "tubule" and by the open apothecia, as Schwendener affirms in the conclusion of his paper "On the Gonidia question." Like the gonidimia of the thallus, they no doubt act chiefly as vivifying stimulants.

segments certain hyphal filaments which, as they became more evolute, invested the gonidimia, and these, as he says, increased in size owing to the influence of the hyphæ, which prevented them from undergoing division. From this hyphal involution, under special circumstances of cultivation, a more or less differentiated thallus at length became apparent, and a lichen was, strange to say, synthetically manufactured out of a lichen-spore and lichen-gonidimia. Here, however, it is but right to notice that in *Symbiosis* the spore is "assumed" to be a fungus * and the gonidia to be algals, which, like other assumptions in Schwendenerism, is clearly a "begging of the whole question." Any logical synthesis which could substantiate the hypothesis would evidently be the formation of a lichen by means of the coalition of the filaments of a well-ascertained fungus and an authentic algal. In regard to this, Dr. Lindsay, in a communication against Schwendenerism, which appeared in 'Nature' for January 27th, 1876, says:—"If, by artificial cultivation, such a union (*i. e.* of a fungus and algal) could be made to produce a lichen, the theory might be held as proved" †. Now direct observations made in nature itself have shown me that such contact between the hyphæ of a *Pyrenomycetes* and a *Protococcus,* instead of producing anything in the shape of a lichen, is simply destructive to the algal, which the mycelium overruns and involves. Besides, and as is well known to every practical lichenist, in cases where fungal hyphæ attack (as they often do) either the epithecium or the hymenium of lichen-apothecia, the texture is at once destroyed and the apothecium is killed by the parasite. Hence, instead of there being any affinity, as presumed, there is a mortal antagonism between a lichen and a fungus, which would at once have become apparent had the Schwendenerians tried to cultivate lichens, according to the principle involved in their theory and upon which it is directly founded *. This is fully corroborated by the observations of Mr. Marshall Ward on *Strigula complanata*, Fée (*vide* Trans. Linn. Soc., Bot. vol. ii. pt. 6, 1884), though the author strangely fancies these to be entirely confirmatory of the Algo-lichen hypothesis. The fungal-mycelium of which he speaks as occurring so frequently on the leaf of *Michelia*, &c., and coming into contact with the assumed algals, that is the "platygonidia" of *Strigula* (in which even when fertile there are scarcely any or no licheno-hyphæ present), at length, as he acknowledges, destroys the "algals," which it invests with its meshes. The same phenomenon also takes place in our British species of *Strigula*, viz. *S. Babingtonii*, when similarly invaded by the proto-hyphæ of *Capnodium Footii*, with which it is often associated on the same leaf.

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* The spores of Lichens, notwithstanding a certain similarity, are of a totally different nature from those of Fungi, differing, amongst other characters, in their consistency, in the nature of the hymenial gelatine, and in their producing licheno-hyphæ (*vid. infra*). Indeed, that the spore of a lichen cannot be a fungal-spore is evident from the fact that several maritime lichens are intertidal, whereas even a short immersion in salt water is destructive alike to the protohyphæ and the apothecia of Fungi.

† By some singular misunderstanding of the subject, Dr. Vines (in Quart. Journ. Micr. Sc. vol. xviii. n. s. p. 153), after quoting these words of Dr. Lindsay, immediately adds, "Such evidence is afforded by Stahl's paper on the nature of hymenial gonidia"!

But apart altogether from such considerations relating to lichen-culture, there are two fatal objections to the hypothesis, either of which is quite sufficient for its subversion. The first of these has reference to the very peculiar nature of the parasitism involved in the theory that the fungal-hyphæ are nourished by the captive algals. Other plants, from which parasites draw their nourishment, usually become speedily exhausted and finally perish, often involving in their death that of the parasite itself. In some cases, indeed, where the host is of sufficient size and vigour to supply food alike for its guest and itself, it may, for a more or less protracted period, suffer but little injury. But here we have a parasite exceeding in size and number of cells by many hundred times the nourishing plant which it invests, and yet, so far from exhausting, only invigorating its host—a phenomenon which certainly nowhere else occurs in nature (*vide* Caspary, "Ueber die neueren Ansichten in Betreff der Flechten," &c., 1872). Such parasitism is indeed acknowledged by Schwendener himself, in the last of the memoirs above cited, as being unique in the Vegetable Kingdom. At the same time he fancied that the *Nostoc*-chaplets recorded by Strasburger as occurring in the leaves of *Azorella*, by Reinke on the stems of some species of *Gunnera*, by Janczewski in the interior of *Anthoceros*, and by Cohn in the tissues of *Lemna*, have brought to notice cases of adaptation in a certain sense analogous to the parasitism involved in this theory. Such entophytic algals, however, are evidently veritable parasites, and prove nothing as to any algo-fungal parasitism in the lichen. It has, also, more recently been alleged (though surely not seriously!) that Schwendenerism has received a certain kind of support from the supposed existence of some unicellular Algæ, *Zoochlorella* and *Zooxanthella*, as they have been termed, which occur as parasites in some families of Zoophytes, and which, nourished at the expense of the protoplasm of their hosts, at the same time contribute to the synthetical formation of the organic substances utilized by these inferior animals. But these chlorophylloid bodies have not yet been proved to be true Algæ, and even if they were so, there would be no analogy whatever between such parasitism and that of the Algo-lichen theory.

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* Strange to say, however, according to the observations of M. Bonnier (*vide* Bull. Soc. Bot. Fr. 1883, p. 87) a lichen does not require any algal whatever for its fabrication. This new discoverer has himself made lichens from the protoplasm of "Mosses" associated with spores,—a new kind of Commensalism of which even Schwendener never dreamed.

Reverting, therefore, to Schwendenerism, and granting that the presumed slave not only feeds its master, but also in doing so flourishes and multiplies all the more, "Upon what," as Mr. Bentham so pertinently asks (Anniv. Address, Linn. Soc. 1872, p. 28), "do the gonidia themselves feed?" This is a very important point in the physiology of Lichens, which Schwendenerism cannot satisfactorily explain. Detained in a dark and narrow prison, and deprived of the free life they formerly led by the tyrant who has surrounded and enclosed them in his meshes, they are evidently cut off from all communication with that outer world, from which they could receive such nourishment as they themselves require, and the much larger quantity their master exacts from them. Whence, then, and how is this nutriment derived? Now it is a well-established fact that lichens obtain their whole nourishment from water, with the different ingredients contained in it and necessary for their existence, according as that water comes from the clouds, from dew, from rivers and lakes, or from the sea. It has sometimes indeed been affirmed (and distinctly so by Schwendener) that the nutriment of lichens is also partly furnished by means of the substratum. This, however, is a mistake, for, as experiment shows, they thus derive nothing, and, in the case of crustaceous species, evidently can derive nothing in the shape of nutrition (*cfr.* Nyl. in 'Flora,' 1874, p. 60). Anything that they can in this way derive is simply through immixtion with their elements of certain particles, such as iron and chalk, dissolved by the water which is poured forth around them and mechanically received. Their true nutriment, derived, as we have said, from water, chiefly rain-water, is directly poured forth upon their surface, and penetrates the cortical stratum (when this is present) till it reaches the gonidial stratum, around which the active vegetative life especially has its seat. The gonidia, therefore, are not special nutritive organs, although (as the instruments of absorbing carbonic acid) they greatly aid in promoting the nutrition, but act rather as vivifying stimulants,—the nutrition taking place through the corticali-gonidial stratum, in which the cellules also play their part, and serve in the slow nutrient process which is so characteristic of lichens. Consequently neither the poor prisoners nor the tyrant master act the parts assigned to them in Schwenderism; and the strange parasitism which it assumes is found on investigation to have no actual existence.

The second objection, and one of even greater validity, is that there are neither fungal-mycelia nor algal-colonies in the structure of Lichens. Indeed, were there so, we should naturally expect to find Lichens most abundant in those habitats which are most frequented by Fungi and Algæ, and there perceive the whole process of manufacture going on before our eyes. Every field-lichenist, however, is perfectly aware that he need not look for lichens where these other Cryptogams have their special haunts. Similarly and conversely, lichens in all stages of growth are mèt with plentifully in situations, *e. g.* granitic detritus and boulders towards the summits of lofty mountains, where fungal-mycelia and terrestrial algals are unknown. But, notwithstanding a certain superficial resemblance between the hyphæ of Lichens and of Fungi, their structure and character, as Nylander has repeatedly shown, are entirely different. The hyphæ, or rather "myelohyphæ," Nyl., of Lichens, are perennial, firm, with thick walls, penetrated by lichenin, imputrible, and not dissolved by hydrate of potash. On the other hand, the hyphoid mycelia or "protohyphæ" of Fungi are caducous, very soft, with thin walls, not at all amylaceous, readily putrifying on maceration, and on the application of hydrate of potash immediately becoming dissolved. Moreover, the licheno-hyphæ are rigid though elastic, nowhere flexuose and contorted*, but straight or straightish, so that they possess no "involving" power whatever, as the Schwendenerians assume. The hyphæ of Fungi, on the contrary, being soft and flexible, readily involve and enclose foreign substances, and indeed morphologically require the faculty of repeated contortions, in order to form the cellulose nucleus of the receptacle (*cfr.* Osw. Kihlman, Entwickel. der Ascomyceten, 1883). There is evidently, therefore, no fungal mycelium in the lichen.

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* M. Stahl, in the work already referred to (Heft i., "Ueber die geschlechtliche Fortpflanzung der Collemaceen") represents the apothecia as originating from filamentose contortions or contorted hyphæ. This, however, as shown by Nylander (in 'Flora,' 1859, p. 625, and 1879, p. 304), is entirely erroneous, and consequently is of itself sufficient to cast great doubt upon all Stahl's other observations.

Again, with respect to the gonidia, notwithstanding their general resemblance to certain of the lower algals, it by no means follows that similarity is identity,—the two things being logically very different. The circumstance of the lichen-gonidia being subsimilar to such Algæ in form and structure only shows that there is a certain "parallelism" between them, and does not militate against both being regarded as belonging to distinct classes of plants*. Indeed the chlorophyll, or phycochrom, in Lichens originates in the same way as in the cellules of other classes of plants (Phanerogams and Cryptogams) in which it occurs ; the only difference being that the gonidia are often seen as discrete cellules, although many forms variously composed are also not uncommon. Moreover, many genera and species formerly supposed to be algals, and regarded by Schwendenerians as furnishing gonidia to lichens, have of recent years, in consequence of the discovery of their fructification, been proved to belong to lichens. Thus *Sirosiphon*, *Hormosiphon*, *Scytonema*, *Stigonema*, *Cora*, *Dichonema*, *Chroolepus* or *Trentepohlia*, *Nostoc*, and *Glœocapsa* (at least in part), *Gongrosira*, and probably *Phyllactidium*, have now to be removed from the class of the Algæ, and consequently can no longer be pressed into the service of the Algolichen hypothesis†. In other respects the various forms of lichen-gonidia are so well-marked as to admit of a distinct classification and nomenclature of their own. These have been elaborately expounded by Nylander, with diagnoses of the different types, in 'Flora,' 1877, pp. 358–9; from which it is evident that while some gonidia and gonimia bear a resemblance to certain algals, others are so different as never to have found a place amongst these latter. This had already been observed by Koerber in his valuable essay 'Zur Abwehr der Schwendener-Bornet'-schen Flechtentheorie' (1874), where, towards the close of his argument, he says that if the gonidia were all true Algæ, they would all have been met with in the free state, whereas this is by no means the case; the gonidia, for instance, of *Nætrocymbe, Phylliscum*, *Melanornia*, and others, having not yet been found elsewhere than within the lichen-thallus *. Nylander also, and more distinctly, affirms (*l. c.* p. 356) that the gonidia of lichens do not in nature at the same time occur within the thallus, and living free without it. This disposes of an alternative which was at one time put forward in opposition to Schwendenerism, viz. that many of the presumed algals of the hypothesis were probably only erratic gonidia vegetating separately. Numerous observations, however, entirely homologate Nylander's statement; so that we may regard it as well established that the gonidia of lichens in their different types and forms are nowhere seen save within the lichen-thallus †, and therefore cannot be Algæ. Hence, as there is no fungus-mycelium, so neither is there any algal-colony in the lichen.

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* Such parallelism was long ago well pointed out by Thwaites in a paper "On the Gonidia of Lichens" (Ann. & Mag. Nat. Hist. 2 ser. vol. iii. 1849). He rightly saw in the similarity of the gonidia to the Algæ, not *identity*, but only "a typical character of essential structure binding together numerous species of various forms, and enabling us to distinguish at once in other species resemblances of analogy from those of affinity."

† Nor does the evolution of zoospores in free gonidia (*i. e.* in unstratified thalli), as in *Chroolepus*, at all identify such gonidia with algals, since in this there would again be only a similarity, and nothing contrary to the nature of lichens.

From the considerations now adduced, it is evident that the three propositions laid down by Koerber in the essay referred to are correct, and rest upon even better grounds than he himself imagined. These propositions are (1) that the tissue in which the gonidia of a lichen are imbedded is not of a fungoid nature; (2) that the gonidia themselves are not true Algæ; and (3) that lichens are not the expression of a condition of parasitism. But though such considerations are quite sufficient for the subversion of the Algo-lichen hypothesis, the crucial point of the origin of the gonidia and their relation to the rest of the thallus still remains to be expiscated. It is clearly not enough to show that Schwenderism is impossible, for the mere rejection of one erroneous theory would not bring us nearer to the actual solution of the problem. Now the whole of the hypothesis proceeds on the assumption that there is no genetic but only a parasitical relation between the filamentose hyphæ and the gonidia. The former part of the assumption is quite correct, and the latter is entirely wrong. Indeed, all researches in the way of proving a connexion, whether genetic or parasitic, between these two elements is, as will presently appear, neither more nor less than going in quest of "a mare's nest,"—is an attempt to discover what has no actual existence. And yet the gonidia, equally with the hyphæ, belong to and are essential organs of the autonomous (not composite) plant called a lichen. How, then, do the gonidia originate in, and how are they related to, the thallus?

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* Professor Cohn (in "Conspectus Familiarum Crypt." &c., in 'Hedwigia,' 1872, p. 17) also affirms that algals from which *Usnea*, *Cladonia*, &c. could proceed are not known. As also directly bearing upon this point, Mr. Archer (in Quart. Journ. Mic. Sc. n. s. vol. xiii. p. 234) puts the very pertinent question, "Why do not several other aerial types, quite as accessible to an intruding parasite as other species, play their part as gonidia-formers?"

† This of course does not apply to the "soredia," or the rounded pulverulent eruptions which frequently occur on the cortical stratum, and which consist of gonidia intermingled with medullary hyphæ protruded along with them. These, being but loosely adherent to the surface of the thallus, are readily disseminated outside the lichen, though occasionally, as in *Alectoria nidulifera* and the specimens exhibited of *Usnea ceratina* var. *scabrosa*, they originate propagula while still adherent to the thallus. In these soredia the gonidia constitute a "syngonidium," and are in reality fragments of the thallus serving, like bulbils or gemmæ, for the propagation of species which occur only in a sterile condition.

On this point, as I have already hinted, previous to the date at which Speerschneider adopted and endeavoured to illustrate the Bayrhofferian origin of the gonidia, there appeared in 1852 a valuable work by the celebrated Tulasne, entitled 'Mémoire pour servir à l'histoire des Lichens.' In the appended plates by which he illustrates his researches on the morphology of Lichens, there are several figures which show sufficiently well the origin of the gonidia in the thallus at a very early stage of its growth. These may be seen in tab. iii. ff. 1–3, in the case of *Lecanora cinerea*, and in tab. xi. f. 17, in the case of *Cladonia coccifera*; though in the text the explanation which he gives of their origin is occasionally in some respects rather confused. In p. 36, however, when treating of the young squamules of growing *Cladonia pyxidata*, he, with sufficient accuracy, indicates the origin of the gonidia as follows:—"Here and there upon the elementary filaments (*i. e.* the hypothallus) some small sessile cellules are generated, sphæroid and colourless, which, after multiplying themselves, give origin in their turn to larger cellules in which the chlorophyll is collected together." So also in p. 22, when speaking of the gonidimia of *Endocarpon miniatum*, he says:—"In these cells (*i. e.* of the cortical stratum) is produced the chlorophyll." Similarly in Nylander's 'Synopsis Methodica Lichenum' (1858), tab. i. ff. 1, 3, 4, 6, the sections of the different thalli there given, belonging to several tribes and genera, show, even at first sight, the gonidia enclosed in the thalline cellules under conditions in which they could not have entered from without, but must have originated in the cellules themselves. It is rather singular that both in the case of Tulasne and of Nylander these statements and figures should have until recently been entirely overlooked, and their import not comprehended either by the supporters or the opponents of the Algo-lichen theory. In them, however, we obtain the clue which is to guide us in our further inquiries upon the subject.

As already shown, lichens can scarcely in ordinary circumstances be successfully cultivated from the spores beyond a certain stage (hypothalline) of growth. This, however, is the less to be regretted, because in nature itself (and nature is always its own best interpreter) we can in some instances behold the whole process of the evolution of the thallus. More especially is this the case with respect to crustaceous species growing pure upon such substrata as quartz rock, flint stones, and young bark of trees *. In the various Lecanoras and Lecideas which occur on the surfaces of these, we can readily trace the life-history of a lichen, in so far as the vegetative organs are concerned, through every stage from the germinating spore to the perfect plant, in the manner now to be described. On germination, as may easily be seen in spore-culture (and indeed not unfrequently even in the apothecia themselves), the spore sends forth from the endospore, in various ways †, a germinating filament or filaments called the *prothallus*. This speedily passes into the *hypothallus*, and between the two there is in reality no distinct line of demarcation. The myelohyphæ thus produced contain lichenin from the very first, and in other respects present the distinctive characters already mentioned. The hypothallus, as developed, is closely agglutinated to and very thinly expanded upon the substratum, becoming in some cases soon evanescent, and in others undergoing various modifications *. In its earlier stage it differs somewhat in figure, being at one time either dendritically divergent or otherwise effigurate, and at another time more continuous and only at the circumference plumoso-radiating. The numerous specimens exhibited of *Lecanora gibbosa* (silicole), *Lecidea geographica* (quartzicole), and *Lecidea alboatra* (silicole) show the gradual evolution of the thallus from its earliest hypothalline condition. In these the hypothallus is blackish and radiating; but in other lichens, such as the vitricole specimen of *Lecanora galactina*, also exhibited, it is white, consisting of byssine filaments laterally apposite and contiguous. This hypothalline stratum, as will be apparent from what has now been said, constitutes the foundation of the lichen-thallus by which it is affixed to the substratum.

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* Where the substratum is not pure but shows various heterogeneous growths, as is usually the case on the trunks of old trees, we often find, especially in the case of Opegraphas, Arthonias, and Verrucarias, different forms of gonidia immixed and confused, apparently constituting the same thallus. Hence Bornet, as already noticed, and more recently Almquist (in 'Monographia Arthoniarum Scandinaviæ,' 1880), erroneously assume the presence of diverse gonidia in the same lichen—a polymorphism which is entirely owing to "the struggle for existence" amongst different species.

† Numerous illustrations of germinating spores belonging to various tribes and genera of Lichens may be seen in the Tables appended to the 'Mémoire' of Tulasne already cited.

Now evidently is the time when, according to Schwendenerism, we ought to find the hyphæ going out in quest of algæ, which they might lay hold of and imprison in their meshes, as "the spider does the fly" in its web. But what is the actual state of the case? In all the young hypothalline formations before you, there is not the slightest vestige on the specimens of any algal, *Protococcus* or other, which they can thus entrap, nor of any gonidia developing either from the branches or from any other part of the hyphæ †. These, it will also be observed, whether simple or branched, are constantly directed straight forwards, without any twisting about to hunt for algals, even were any such present. And yet at a slightly more advanced stage of growth, you would, on microscopical examination, detect plenty of gonidia in these specimens. Whence, then, and how, do these originate? If the hyphæ are not parasitical on the gonidia, may it not be that the gonidia are parasitical on the hyphæ?—an alternative at one time suggested, but which evidently is as untenable as Schwendenerism. The matter, however, lies in a nutshell, and admits of a very easy explanation. On a further inspection of the specimens, you will readily perceive upon the surface of the hypothalline stratum the presence of a number of small, variously coloured glomerules, with which it is more or less sprinkled. These are formed at an early stage of the evolution of the hypothallus, at or towards its centre, and in immediate proximity to where the spore first germinated *. On anatomical dissection it is found that these glomerules consist of minute cellulose granules, in the cellules of which are to be seen the gonidia in various stages of evolution. From the fact of their thus occurring in a growing condition, and the impossibility of their entering from without through the closed walls of the cellules, it is evident that the gonidia originate in the glomerules themselves (just as the spores do in the apothecia), and are consequently self-developed organs of the lichen. Now these glomeruli constitute the first parenchymatous tissue which is directly developed upon the hypothallus. Like all the other elements of the thallus, this parenchyma is formed, as Nylander has well expressed it (*vide* 'Flora,' 1879, p. 303), "by an innate power or impulse of procreation which is inherent in the spore itself, and is not communicated from any foreign source, the only assistance rendered being, as already noticed, the materials derived from the atmosphere, especially in the form of rain-water."

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* Sometimes, as in foliaceous lichens, it appears in the form of rhizinæ; and at other times, in crustaceous lichens, it is visible only as a thin line limiting the thallus.

† Dr. Minks (a disciple of Bayrhoffer), in his treatise 'Das Microgonidium' (1879), supposes that he had detected in the hyphæ, and indeed in every portion of the lichen-thallus, whether vegetative or reproductive, certain minute corpuscles which he terms "microgonidia," and which constitute the initial state of gonidia into which they are afterwards developed. As has elsewhere, however, been shown (*vide* Nyl. in Flora, 1879, p. 206), these so-called gonidia are simply the "molecular granulations" which are found in the different cellules, and which do not at all undergo the wonderful transformations indicated by Dr. Minks. This is also proved by his subsequent alleged discovery of them in a large number of species belonging to the Ascomycetes (*vide* 'Symbolæ Licheno-Mycologicæ,' 1881), in which, as is well known, real gonidia never occur.

The glomerules, of which (as may be seen from the specimens) one or more are put forth at the same time, gradually become more numerous and contiguous, as the process of development goes on, until at length a continuous cortical stratum is formed upon the hypothallus. It certainly seems very strange that these cortical cellules in which the gonidia arise should be either quite ignored or not rightly discriminated by Schwendenerians, who speak as if only two elements entered into the structure of the lichen, viz. hyphæ and gonidia, whereas to these must unquestionably be added a third element, viz. the cellular cortical tissue *. But not only in young crustaceous thalli do we thus perceive the gonidia originating in the cellules of the first-formed parenchymatous tissue, but even in adult thalli amongst the higher foliaceous lichens we can sometimes observe growing gonidia in the cortical cellules. This is the case in such species as *Physcia pulverulenta*, *Ph. lithotea*, *Umbilicaria pustulata*, *Psoroma hypnorum*, &c., in which the thalli have the cellules very distinct and evident (not confused or obliterated), and are consequently best adapted for examination. So also the intracellular origin of the gonidia is equally apparent in the thalline margin of lecanorine apothecia, and even of biatorine apothecia which have gonidia intruded into their proper margin, where they are seen in a young or growing state towards its external and youngest portion. As to the origin of the gonidia in the gonidial stratum, this also admits of a ready and simple interpretation. "The cortical stratum," as observed by Nylander in 'Flora,' 1877, p. 354, "gradually increasing and expanding, is at the same time in like proportion dissolved (or *resorbed*, as it is termed in physiology) beneath, and the gonidia consequently become free." In this condition, whether enclosed in cellules or variously conjoined or discrete, they constitute the narrow gonidial stratum, which is situated between the lower portion of the cortical and the upper portion of the medullary strata. This latter stratum is produced from the cortical cellular tissue and arises in the thallus either before or at the same time as the gonidial stratum, so that though situated beneath this, it is not posterior in its formation. When the medulla is filamentose (for it is frequently crustaceous, as it subsequently becomes in the specimens exhibited, and is also occasionally cellulose*), the gonidia are often seen attached to the radicles of the lichenohyphæ of its exterior portion. This attachment, however, is in no way genetic or parasitic, nor does it argue any kind of "copulation" whatever, as Schwendenerism affirms. The gonidia are in fact neither adnate to nor penetrated by the myelohyphæ †, but only adherent to them by means of the lichenin, with which all the different elements of the thallus are penetrated. This holds good equally in the case of unstratified thalli, where lichenohyphæ are present, as amongst the Collemacei and the lower genera of the Lichenacei. In all such instances, the apparent copulation is simply an amylaceous adherence, and the fancied penetration the result of erroneous observation, or of an abnormal condition of the gonidia.

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* Specimens illustrating the earlier stages of lichen-growth (which of course never appear in herbaria) seem to be entirely unknown to the supporters of Schwendenerism.

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* This origin of the gonidia, which was first, as we have already stated, observed by Tulasne, was further confirmed by Arcangeli ("Sulla questione del gonidi") in Nuov. Giorn. Bot. Ital 1875, where, after recording various observations made by him upon several lichens, he says that "the gonidia arise from organs which have a more or less pseudo-parenchymatous structure." It is, however, to Dr. Nylander, whose long services to lichenological science are so valuable and extensive, that we owe the actual demonstration of the origin of the gonidia and of their relation to the other elements of the thallus (*vide* 'Flora' from 1877, *passim*).

Such, then, is the undoubted origin of the gonidia in, and their relation to, the rest of the lichen-thallus. To trace this in every instance from the germinating spore to the perfect thallus throughout the various families and tribes, is by cultivation apparently impossible, and in nature itself by no means an easy matter. There can, however, be no doubt that what is true in the above instances is true also in all others. For as Schwendener, while predicating the same phenomenon witnessed by Reess for all the lichens in general, whose evolution he himself had studied, rightly affirms (in Erör. zur Gonid.), "It is inconceivable that a plant should become developed at one time in one way, and at another time in one completely different." Hence in the Collemacei, the stronghold of Schwendenerism, where it is more difficult to trace the progressive evolution of the thallus, it is evident that the assumed algo-fungal-lichen phenomena seen by its supporters must be interpreted in accordance with the well ascertained facts now brought under your notice. But even in these we are not quite left without the means of satisfactorily overcoming the difficulty. The real state of the case here may—as pointed out by Nylander in a paper "On the Gonimic Evolution of the Collemacei" (in 'Flora,' 1868)—"be best demonstrated by attending to normal physiological conditions rather than by observations founded on textures disrupted and torn asunder anatomically." Now in the isidia, with which the upper surface of the thallus of many species is more or less sprinkled, and which are evidently propagula and entirely comparable with the bulbils of Phanerogams, "we have the whole history of the evolution of the thallus from its first origin from a cellule containing a single gonimium to a minute true Nostoc, and ultimately to the perfect Collemaceous texture." Similarly, on this point he states more explicitly in the 'Flora,' 1874, p. 5, that "the cellule at first is observed to be empty, and then, by the aid of secretion, there gradually is produced the green matter, and it assumes its definite form." It follows, therefore, that *Nostoc*, instead of being an independent algal, which according to Schwendenerism grows normally at one time as such, and becomes at another time the host of a parasitic fungus, is in reality to be viewed as constituting the initial or rudimentary state of *Collema* or *Leptogium**. This notion had at different times been held by many cryptogamists, though the actual transition, which is best seen in the isidia, had not been witnessed by them.

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* In the cellulose medulla also, as in *Psoroma hypnorum*, the gonidia are seen to be produced in the interior of the cellules, just as they are in those of the cortical stratum.

† Treub, who specially investigated this point, never saw the hyphal extremities penetrating into an uninjured gonidium—still with contents; nor from their nature can they have any such power of penetration. Indeed, as has been well observed by Mr. Archer (Trans. Journ. Micr. Sc. n. s. xiii. p. 234), Bornet's researches on the subject, which showed in certain cases the hypha destroying the gonidium (*vide* p. 263), prove too much in so far as Schwendenerism is concerned, inasmuch as Schwendener's parasite does not destroy, but rather stimulates.

In connection with this point it has been alleged by Schwendenerians that the "cephalodia" which occur in many species of Lichens, *e. g.* in *Stereocaulei*, owe their origin to certain so-called "algals"—*Nostoc*, *Stigonema*, *Sirosiphon*, and *Scytonema*—insinuating themselves into the lichen-thallus and so producing these morbid excrescences. Apart, however, from other considerations, it has just been pointed out by Nylander, in 'Flora,' 1884, p. 220 (note), that the syngonimia of cephalodia (as indeed also the thalline syngonimia) give no reaction with hydrochloric (muriatic) acid, whereas in *Nostoc*, *Scytonema*, and *Sirosiphon* an æruginose reaction is always thus produced.

It is further to be observed that in the Collemacei, where there is scarcely any distinct hypothallus, this being represented only in some species by a few rhizinæ, the gonimia arise (as is also well seen in the isidia) in the gelatinous thalline substance before the medullary hyphæ, amongst which they are seen lying either scattered, or usually conjoined, or variously conglomerated, and constituting, as also each isidium does, what Nylander has termed a "syngonimium." The lichenohyphæ of the medulla, when they are present (for here also, as in the Lichenacei, the medulla is sometimes entirely cellulose), most probably originate from the cortical stratum, which is more or less evolute, though this point requires further investigation. But however this may be, their relation in every instance to the gonimia is in no way one of copulation or parasitism, but simply and solely, as already stated, of adhesion (where such exists) by means of the lichenin which permeates the thallus.

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* Nylander, in 'Flora' (1868), has also pointed out that certain *Glœocapsæ* similarly constitute the thallus of various other Collemacei, e. g. *Synalissa picina*, *S. meladermia*, *Collema evilescens*, and *Bryophagus glœocapsa*, which have been adduced by Schwendener as lending support to his theory.

In the Ephebacei again, the whole thallus, *i. e.* each single filament from the base to the apex, or each single fruticule more or less branched from the base to the apices, constitutes also a syngonimium. The gonimia here, which are tunicated, or involved in a gelatinous membrane, originate within the cellules, and after the formation of the cellules, in the manner so fully described by Nylander when treating of *Nematonostoc* (*vide* Bull. Soc. Bot. 1873, pp. 263, 264). Since this evidently elucidates also the evolution of the gonimia in the Collemacei, his observations may here with propriety be transcribed, subversive as they are alike of Schwendenerism and Minksianism. "In a physiological respect," he says, "it is to be noticed that this *Nematonostoc* (as is usual in analogous thalli) is propagated by gemmules, or minute isidiomorphous globules. These gemmules are at first globulose, simple, agonimic cellules, which in growing become oblong and are divided by a septum: afterwards by the addition of a cruciate septum they are seen to be quadrilocular, and gradually pluricellulose. But at the same time, in these gemmules, while still in a young state, are produced the gonimia, at first a single gonimium in each loculus, and later two and more (through the division by constriction of the first gonimium), so that moniliform gonimia are produced, and in maturity the internal cellulose texture disappears. Thus from the very beginning the gonimia are produced within the cellules, and after the formation of the involving cellules." Such briefly stated is unquestionably the origin and the subsequent evolution of the gonimia alike in the Ephebacei and the Collemacei, as demonstrated on a microscopical examination of the isidia, or so-called Nostocine conditions which many of them present, especially when sterile. If, then, the gonimia originate, as they certainly do, in these cellules, they necessarily belong to the lichen-thallus, of which, as we have already seen, they are special and important organs. Consequently they cannot be algals, as Schwendenerism erroneously assumes. Moreover, as the species of which the Ephebacei are composed possess no lichenohyphæ whatever, the theory is in their case evidently impossible.

From all these various considerations and illustrations, to which others, though of minor importance, might easily be added, it is clear that the Algo-lichen hypothesis rests upon no solid basis whatever, but simply and solely upon imagination, and that it is merely a plausible attempt to explain certain phenomena which its author and adherents supposed to be otherwise inexplicable. Notwithstanding the laboured arguments by which it has been sought to deprive them of their autonomy and intrude them amongst the Ascomycetes, Lichens still remain a distinct class of plants, intermediate between the Algæ and the Fungi, related to the former through the Ephebacei and to the latter through various species of their lower genera. It is no doubt difficult at times to draw a definite line of demarcation between some of them and these other two classes; but this is only what often happens elsewhere, till more accurate observation at length solves the difficulty *. At the same time, however, with respect to Lichens, all correct observations and logical deductions show that the words of Acharius in the conclusion of the Introduction to his 'Lichenographia Universalis' (p. xiv) are still as true as when he wrote them:—. . . . . "Uti ratum habeo: Lichenes ordinem naturalem peculiarem et a reliquis plantis Cryptogamis distinctum constituere." Distinct they certainly are alike in the structure of their thallus and the mode of their nutrition, and more peculiar still in their very slow and inter-

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* Indeed, as every systematist well knows, it is constantly becoming more and more difficult to draw any such definite lines, especially in several of the lower Orders of plants. Living nature in its wild luxuriance (whether as the result of evolution or degradation of primordial types) refuses to be bound by strictly mathematical laws. Hence the limits of Classes (or Orders, &c.) must to a certain extent necessarily vary as our biological researches are more extended and minute. In enabling us in many cases to ascertain such limits with any precision, chemistry will no doubt play a still more important part in the near future than it has hitherto done.

mittent manner of life, and especially in their extreme longevity (*vide* Crombie, Art. "Lichens" in Encyclopædia Britannica, 1882, p. 558)*. Lichens therefore are Lichens and nothing else—neither Fungi nor Algæ, nor any intermixture of these; but everywhere and constantly preserving their own distinct type, and distinguished by many important characters peculiar to themselves. Such of these as have a more direct bearing upon the solution of the problem before us have been more or less fully noticed in the preceding observations. From these it is sufficiently evident that Schwendenerism, whether viewed anatomically or biologically, analytically or synthetically, is, instead of being true science, only the "Romance of Lichenology," as I have elsewhere termed it (*vide* Pop. Sc. Rev. 1874, p. 276). And thus also the origin of the gonidia in, and their relation to, the rest of the lichen-thallus belong to the very rudiments of Morphological Botany, and constitute the ABC of Lichenology.

DESCRIPTION OF THE PLATES.

Plate VIII.

Fig. 1. Hypothalline state of *Cladonia coccifera*, magnified, showing the first cortical glomerules developed upon the hypothallus, in the cellules of which the gonidia originate. After Tulasne.

Fig. 2. Similar hypothalline condition of *Lecanora gibbosa*, magnified. 2*a*. Gonidia as seen enclosed in the cellules of the pseudo-parenchyma, magnified about 270 diameters.

Fig. 3. Similar hypothalline state of *Lecidea alboatra*, with dendritically arranged filaments and the first minute cortical glomerules, nat. size. 3*a*. A portion magnified.

Plate IX.

Fig. 4. *Lecidea geographica*, hypothalline condition, portion, of natural size, as shown growing on a small piece of quartz rock. 4*a*. A portion of the same enlarged about four times its nat. size.

Fig. 5. Thin section of the cellulose cortical stratum and of the medullary hyphæ of *Physcia pulverulenta*, showing the gonidia originating within the cellules, × 300.

Fig. 6. Vertical section of thallus of *Umbilicaria pustulata*, magnified about 250 diameters, showing the genesis of the gonidia within the cellules of the lower portion of the minutely cellulose corticali-gonidial stratum, from which it is evident that they are not in any way produced from the medullary hyphæ (*cfr.* Nylander in 'Flora,' 1875, p. 303).

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* This longevity is to be measured in many cases, not merely by centuries, but apparently by millenniums.

Fig. 7. Section of thallus of *Psoroma hypnorum*, highly magnified, showing the gonidia enclosed in the cellules of the cellulose medulla. 7*a*. Separated gonidia enclosed in the cellules, magnified 275 diameters. After Nylander.

Fig. 8. Isidiose globules of *Collema furvum* in different stages of growth, showing that the gonimia originate from the very first in the isidia themselves. 8*a*. A syngonimium fully developed, magnified.

On the Flora of the Philippine Islands, and its probable Derivation. By R. A. Rolfe, Herbarium, Royal Gardens, Kew. (Communicated by Prof. Oliver, F.R.S., F.L.S.)

[Read 1st May, 1884.]

(Plate X.)

The Philippines are a large group of islands situated to the north-east of the great bank (for the most part less than 50 fathoms below the surface) which stretches out from the Siamese and Malayan peninsulas to Sumatra, Java, and Borneo. They extend over nine degrees of latitude and fourteen of longitude, and much of their present configuration is directly due to volcanic agency. The northern island of Luzon is the largest of the group, being about the size of Ireland, though of a very different shape. Mindanao, the southern island, is of almost equal extent. Negros, Samar, Panay, Mindoro, and Palawan are each about one eighth to a tenth as large as Luzon; Leyte, Cebu, Bohol, and Masbate are still smaller; while a large number, gradually decreasing in size, are scattered about in various directions.

The Philippines are for the most part surrounded by deep sea, but there are several submerged banks, indicating connections with neighbouring islands at some former period. One of these banks stretches away from the northern point of Luzon in the direction of Formosa, and on it are situated two small groups of islets —the Bashees and the Babuyanes. North of these a deep channel extends to the southern point of Formosa. From the south-western corner of Luzon there is a very distinct connection with the northern point of Borneo, by way of Mindoro, Busuanga, the long island of Palawan, and the small island of Balabac; the deepest channel along this bank being the Mindoro Straits, which separate Mindoro from Busuanga. The Sulu archipelago stretches from the southern point of Mindanao to the north-western point of Borneo. This bank is separated from the former by the Sulu Sea—a deep sea, much of it reaching to over two thousand fathoms. The deepest channel which traverses this bank is near to Borneo, and connects the Sulu Sea with another deep basin of over two thousand fathoms—the Celebes Sea, north of Celebes. The fourth and last bank is not quite so well marked as the previous ones, though sufficiently distinct; it extends from the south-eastern point of Mindanao to the north-eastern point of the curiously-shaped island of Celebes. The Philippines may, indeed, be said to extend over sixteen degrees of longitude, politically at least; for the archipelago as far as the Bashees on the north and the Sulu archipelago on the south both now belong to Spain, like the remainder of the group, with which they can more easily be classed than with any other.

From their position and surroundings we are led to infer that the fauna and flora of these islands must reveal some curious and interesting facts, and it is fortunate that sufficient materials are now to hand to enable us to examine these features. Some branches of the fauna have been pretty well worked out. Mr. Wallace, in his 'Geographical Distribution of Animals' (vol. i. pp. 345–349), and later in his 'Island Life' (pp. 361–362), has given a detailed account of what is known respecting the fauna. From these sources we gather that eighteen genera and twenty-one species of terrestrial Mammalia are known, of which nine tenths of the species are peculiar to the islands. There are also seventeen genera and twenty-four species of Bats. The Birds number 288 species, belonging to at least 117 genera. Of land birds six genera are peculiar to the islands, and two thirds of the total number of species; while of water birds one tenth of the species are peculiar. The proportion of peculiar species, as pointed out by Mr. Wallace, is much larger than is found on any other Malay island. Quoting from a paper read by Lord Walden before the Zoological Society, Mr. Wallace points out that 31 of the Philippine birds occur in the Papuan subregion, 47 in Celebes, 69 in India, and 75 in Java, while one species is confined to the Philippines and Java. Of the genera 50 are of very wide range; 40 are almost exclusively of the Oriental region; 2 exclusively Malayan; 5 are typically Palæarctic, and have reached the islands by way of North China, two of them extending southward to the Moluccas; and 12 belong to the Australian region, of which one is chiefly confined to Australia, one to the Papuan group, and one to Celebes. The Philippines are also peculiarly rich in terrestrial Mollusca, about 400 species being known. *Helix* and *Bulimus* abound in species, the large genus *Cochlostyla* is almost peculiar to the Philippines, and *Pfeifferia* is found also in the Moluccas. These facts are interesting as showing the affinities with surrounding countries and the large proportion of endemic species.

Mr. Wallace has somewhere remarked that the flora is not sufficiently well known for comparison. Since that time, however, a considerable addition has been made to our knowledge. The 'Novissima Appendix,' containing an enumeration of what is known of the flora, with a census of genera and species under each Order (published in the fourth volume of the third edition of Blanco's 'Flora de Filipinas'), the 'Sinopsis de Familias y Generos de Plantas Leñosas de Filipinas' (a work containing figures of no less than 465 species of 386 genera), by Don Sebastian Vidal, Conservator of Forests in the Philippines, and a collection of about 900 species of plants received at Kew, from the author of the last-named work, have all contributed largely to our knowledge. The 468 coloured plates accompanying the third edition of Blanco's work must also be taken into account, though a considerable proportion of them represent cultivated plants. It is in working up the aforementioned collection, in conjunction with Don Sebastian Vidal, that a large proportion of the data have been accumulated on which the present paper is based, and which I now offer to the Linnean Society as a brief outline of the flora of the islands. I am specially indebted to Don Sebastian Vidal for a large amount of information respecting the islands generally, and their vegetation in particular.

The first paper of any importance on the flora of the Philippines appeared as early as 1704, as an Appendix to the third volume of Ray's 'Historia Plantarum.' It is entitled "Herbarium aliarumque Stirpium in Insula Luzone Philippinarum primaria nascentium, a Rev^{do} Patre Georgio Josepho Camello, S.J., Observatum et Descriptarum Syllabus: ad Joannem Raium transmissus; Additis etiam plurimarum Iconibus, ab auctore propria manu ad vivum delineatis; quas ob sumptum in chalcographos erogandorum defectum impræsentiarum emittere non licuit." This work occupies 96 folio pages, and contains descriptions of a large number of plants, with their native names. Linnæus appears to have overlooked it, and indeed every one else, as I cannot find that anything has been done with it up to the present time. The drawings, however, exist, and a considerable number of the plants, both being preserved in the Sloane

Collection at the British Museum. Father Camell was a Jesuit who for some time resided in the island of Luzon. A number of Philippine plants were collected by Nee during the Malaspina Expedition, and these were described by Cavanilles in his 'Icones,' published between 1791 and 1801. In 1837 Blanco's 'Flora de Filipinas' was published, an octavo volume of 887 pages. This work was published under peculiar circumstances: away from Europe, and without opportunities of consulting European Herbaria, Blanco had to rely solely upon books for his determinations, and of these he had only a limited number. His library consisted principally of some Linnæan works, Aublet's 'Histoire des Plantes de la Guiane françoise,' and some of the early volumes of De Candolle's 'Prodromus.' The geographical distribution of plants does not appear to have been taken much into account, for the bulk of the species were made to fit existing descriptions, some of them belonging to American plants. The work is written in Spanish, and, as no specimens were preserved, great uncertainty has been felt respecting them; but as the native names are given, and many of the plants are from a limited area round Manila, it will yet be possible to identify nearly the whole of them. Many, indeed, are already identified, thanks to the authors of the new edition of the 'Flora de Filipinas,' and to Don Sebastian Vidal, who has taken great pains to obtain specimens from the original localities for the purpose of identification. A second edition appeared in 1845, after Blanco's death, but from his MSS. Several corrections were made, but it is noteworthy that some species described as new in the first edition are here referred to Linnæan names, and not always correctly. A number of Philippine plants, collected by Hænke, were described by Presl in his 'Reliquiæ Hænkeanæ,' published in 1830; and also a number from Cuming's collection by the same author, in his 'Epimeliæ Botanicæ,' published in 1849. In 1843 the 'Plantæ Meyenianæ' was published, as a supplement to the nineteenth volume of the 'Novorum Actorum Academiæ Cæsareæ Leopoldino-Carolinæ Naturæ Curiosorum.' The Orders were worked up by various authors, and a number of Philippine species described. Meyen was for a month in the islands during the rainy season, and his plants are chiefly from Jala-Jala (pronounced Hala-hala), a promontory running into the large lake known as Laguna Bay, near Manila. In 1851 a small work of 116 pages was published by Father Llanos, entitled 'Fragmentos de algunas

Plantas de Filipinas no includas en la Flora de las Islas de la 1ª ni 2ª edicion.' This was also published at Manila, and the species are even more obscure than in Blanco's work. Besides the above, a large number of Philippine plants have been described in various Monographs, in DeCandolle's 'Prodromus,' and elsewhere, from the collections of Callery, Lobb, and others, but especially from the large collection made by the late Mr. Hugh Cuming, and which has been so widely distributed. It is unfortunate that a number of Cuming's plants, collected in Malacca, have been distributed and published as from the Philippines *; also that the numbers in various Herbaria do not always correspond, owing to the loose numbers getting astray. How much of this might be prevented by the number being attached to the plant when gathered, as in Burchell's collections, and the acknowledged uncertainty of the system of quoting numbers prevented. From a list of Cuming's plants preserved at Kew, it appears that numbers 1 to 2242 are from the Philippines, 2243 to 2251 from Sumatra, 2252 to 2399 from Malacca, and 2400 to 2436 from Singapore. It is important, however, that his previous collections from America and the Pacific islands should not be confounded, as these also run from 1 to 1499. A new edition of Blanco's 'Flora de Filipinas' has recently been published, but with some considerable differences from the original one. This third edition comprises four folio volumes, besides 468 plates, equivalent to three volumes more. There are two editions of the plates, one of ordinary black impressions, the other of coloured chromo-lithographs. The first three volumes of text contain a reprint of Blanco's work (the two previous editions compared, and the corrections of the later one retained), with a Latin translation by Father Andrés Naves and Father Celestino Fernandez Villar. The fourth volume contains a reprint of the afore-

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* In this way two genera of Myrtaceæ (*Bæckea* and *Rhodamnia*) and six of Melastomaceæ (*Allomorpha*, *Sonerila*, *Marumia*, *Anplectrum*, *Pternandra*, and *Kibessa*) have erroneously found their way into Villar's enumeration. "Philippines" is written on a sheet of each of the above in the Kew Herbarium, and this led to the Philippines being included in the extra-Indian distribution of the same in Sir J. D. Hooker's 'Flora of British India,' whence they were extracted by Villar. They are, however, all from Malacca, as proved by an old MS. list preserved at Kew, and also by the specimens in Bentham's Herbarium. Still worse is it when this circumstance leads to the imposition of an erroneous specific name, as in the case of *Henslovia philippinensis*, A. DC., founded on Cuming n. 2255, which is really from Malacca.

mentioned 'Fragmentos' by Llanos, also with a Latin translation; a paper on medicinal plants, entitled "Libro de Medicinas de esta Tierra y declaracions de la Virtudes de las Arboles y Plantas que estan en estas Islas Filipinas," by Father Ignacio de Mercado, occupying 58 pages; and a "Novissima Appendix," compiled from various sources, which is intended to include all that is known of the flora up to that date. The latest contribution to the flora is the 'Sinopsis de Familias y Géneros de Plantas Leñosas de Filipinas,' by Don Sebastian Vidal, mentioned above, a work intended for the Forest Service under his charge. Omitting minor pamphlets and scattered descriptions, to which references will be found in the aforementioned 'Appendix,' the foregoing summary represents the bulk of what has been written on the flora of the islands, and we now turn to the 'Appendix' itself. This is compiled from various sources, but the references to Philippine plants in various monographs and scattered papers form the groundwork of it. Next in importance are the plants from Blanco's work, with those of Llanos and Mercado, an attempt being made to refer them to their correct genera and species. Then come the additional species seen growing in various localities; and, lastly, plants cultivated in gardens for ornament or utility, or introduced in various ways. A census of the genera and species under each Order is appended; but the great drawback to it is that everything is included, whether indigenous or merely cultivated. In the text the letter "c" stands for cultivated, but as there is no other distinguishing sign, it is a very slow process to separate them, amongst the mass of letters and figures. In this Appendix the Dicotyledons are by Fernandez Villar, and are made uniform with the 'Genera Plantarum' of Bentham and Hooker. The Monocotyledons were commenced by Naves, and carried on to p. 307 (*Fimbristylis nutans*, Vahl), at which point the work was resumed by Fernandez Villar, who carried it on to its completion. The last part of the 'Genera Plantarum' was not published in time to be utilized for the Monocotyledons. The plates of this work were also determined by Naves; but a considerable number of the determinations are incorrect; not so much the names of Blanco as the extra-Philippine names to which they are referred. Many of these are corrected in the Appendix, but some yet remain to be dealt with as materials come to hand. A great difficulty which the authors had to contend with in the determination of their plants, was the absence of authentic specimens, consequently they had to fall back upon books—Miquel's 'Flora Indiæ Batavæ' and Hooker's 'Flora of British India' being two of the principal ones; and in several of the Orders their determinations must be considered rather as approximate than real: for instance, in the genus *Eugenia* 33 species are identified with Indian ones, but in 23 species from Vidal's collection scarcely one tenth are identical. It is much to be hoped that a set of the types of this work may be deposited in some European Herbarium, thus enabling the errors to be eliminated; for until this is done it will be impossible to obtain a correct idea of the flora.

In the following paper a census of genera and species are given under each Order, with a column showing the endemic element; then an attempt is made to trace the origin of the flora by a comparison with surrounding countries; this is followed by an outline of the distribution of some of the more characteristic species within the group, and the physical causes which have influenced this distribution; and, lastly, a list of some corrections made in working up the aforementioned collection, with the descriptions of a new genus and a few new species.

In the following Census the left-hand column shows the number of indigenous genera and species under each Order, and the right-hand column shows the endemic element. Villar's census includes the cultivated and introduced plants; consequently it does not give a fair idea of the flora. My own is chiefly based on that of Villar, with the introduced species excluded and some recently detected species added; a few which have crept in by error are also excluded. The endemic element is considerable, but the following numbers must be taken as approximate, and as representing the present state of our knowledge; in Orders requiring revision, the numbers are under-estimated for obvious reasons.

CENSUS OF GENERA AND SPECIES.

Natural Order.	INDIGENOUS.		ENDEMIC.	
	Genera.	Species.	Genera.	Species.
1. Ranunculaceæ	2	4		
2. Dilleniaceæ	5	10	1	4
3. Magnoliaceæ	2	5	......	2
4. Anonaceæ	15	43	......	24
5. Menispermaceæ	9	11		
6. Nympheaceæ	2	3		
7. Cruciferæ	1	1		
8. Capparideæ	5	14	......	4
9. Violarieæ	3	3	......	1
10. Bixineæ	5	11	......	2
11. Pittosporeæ	1	4	......	1
12. Polygaleæ	4	6	......	2
13. Caryophylleæ	2	2		
14. Portulaceæ	1	2		
15. Elatineæ	1	2	......	1
16. Hypericineæ	1	4	......	2
17. Guttiferæ	6	22	......	9
18. Ternstrœmiaceæ	6	13	......	10
19. Dipterocarpeæ	5	21	......	13
20. Malvaceæ	11	31	......	6
21. Sterculiaceæ	9	26	......	14
22. Tiliaceæ	7	27	1	14
23. Malpighiaceæ	3	6	......	3
24. Zygophylleæ	1	1		
25. Geraniaceæ	4	6	......	1
26. Rutaceæ	16	44	......	11
27. Simarubeæ	5	6		
28. Ochnaceæ	3	3	......	2
29. Burseraceæ	6	18	......	12
30. Meliaceæ	13	43	......	27
31. Chailletiaceæ	1	6	......	4
32. Olacineæ	8	11	......	4
33. Ilicineæ	1	5	......	4
34. Celastrineæ	6	17	......	10
35. Stackhousiaceæ	1	1		
36. Rhamneæ	7	12	......	3
37. Ampelideæ	2	22	......	9
38. Sapindaceæ	20	48	......	22
39. Anacardiaceæ	7	21	......	6
40. Connaraceæ	4	14	......	10
41. Leguminosæ	65	197	......	33
42. Rosaceæ	5	19	......	9
43. Saxifragaceæ	5	5	......	1
44. Crassulaceæ	1	2		
45. Droseraceæ	1	4	......	1
46. Holorageæ	1	1		
47. Rhizophoreæ	5	10		
48. Combretaceæ	6	21	......	12
49. Myrtaceæ	11	55	......	40
50. Melastomaceæ	8	42	1	15
51. Lythrarieæ	6	15	......	3

Natural Order.	Indigenous.		Endemic.	
	Genera.	Species.	Genera.	Species.
52. Onagrarieæ	3	6		
53. Samydaceæ	3	15	......	8
54. Passifloreæ	1	4		
55. Cucurbitaceæ	11	22	......	1
56. Begoniaceæ	1	13	......	7
57. Datiscaceæ	1	1		
58. Ficoideæ	3	4		
59. Umbelliferæ	2	4		
60. Araliaceæ	9	18	......	6
61. Cornaceæ	2	2		
62. Caprifoliaceæ	3	3	......	1
63. Rubiaceæ	41	140	1	76
64. Compositæ	29	63	......	6
65. Goodenovieæ	1	2		
66. Campanulaceæ	2	4		
67. Vacciniaceæ	1	3	......	2
68. Ericaceæ	3	5	......	2
69. Epacrideæ	1	2		
70. Plumbagineæ	1	1		
71. Myrsineæ	8	35	......	23
72. Sapotaceæ	5	17	......	5
73. Ebenaceæ	2	15	......	7
74. Styraceæ	2	5	......	3
75. Oleaceæ	2	13	......	7
76. Salvadoraceæ	1	1		
77. Apocynaceæ	17	41	......	20
78. Asclepiadeæ	20	51	......	12
79. Loganiaceæ	5	11	......	5
80. Gentianeæ	3	7		
81. Hydrophyllaceæ	1	1		
82. Boragineæ	8	20	......	9
83. Convolvulaceæ	9	42	......	6
84. Solanaceæ	6	21		
85. Scrophularineæ	14	40	......	1
86. Orobanchaceæ	1	3		
87. Lentibularieæ	1	5	......	2
88. Cyrtandraceæ	9	18	......	14
89. Bignoniaceæ	4	10	......	4
90. Acanthaceæ	27	65	......	11
91. Verbenaceæ	12	56	......	31
92. Labiatæ	15	40	......	2
93. Plantagineæ	1	3		
94. Nyctagineæ	2	4		
95. Amarantaceæ	12	26		
96. Chenopodiaceæ	1	1		
97. Polygonaceæ	1	8		
98. Podostemaceæ	1	1	......	1
99. Nepenthaceæ	1	2	......	2
100. Cytinaceæ	2	4		
101. Aristolochiaceæ	2	4	......	3
102. Piperaceæ	3	34	......	8
103. Choranthaceæ	1	2		
104. Myristicaceæ	1	17	......	6

Natural Order.	Indigenous.		Endemic.	
	Genera.	Species.	Genera.	Species.
105. Laurineæ	8	37	......	10
106. Proteaceæ	1	4	......	3
107. Thymelæaceæ	3	7	......	3
108. Elæagnaceæ	1	1		
109. Loranthaceæ	3	20	......	14
110. Santalaceæ	2	2		
111. Balanophoreæ	1	1		
112. Euphorbiaceæ	29	124	......	40
113. Urticaceæ	25	127	......	43
114. Juglandeæ	1	2	......	1
115. Myricaceæ	1	1	......	1
116. Casuarineæ	1	3		
117. Cupuliferæ	2	22	......	12
118. Salicineæ	1	1		
119. Ceratophylleæ	1	1		
120. Gnetaceæ	1	5		
121. Coniferæ	4	8	......	1
122. Cycadaceæ	1	5		
123. Hydrocharideæ	9	12		
124. Burmanniaceæ	3	7		
125. Orchidaceæ	67	460	......	110
126. Scitamineæ	15	97	1	7
127. Hæmadoraceæ	1	1		
128. Amaryllideæ	5	14	......	1
129. Taccaceæ	1	5		
130. Dioscoreaceæ	3	19	1	4
131. Liliaceæ	7	31	......	1
132. Pontederiaceæ	1	6		
133. Philydraceæ	2	2		
134. Xyrideæ	1	4		
135. Commelynaceæ	7	42		
136. Flagellarieæ	1	1		
137. Juncaceæ	3	3		
138. Palmæ	28	83	......	10
139. Pandaneæ	2	21	......	2
140. Typhaceæ	1	1		
141. Aroideæ	21	88	......	6
142. Lemnaceæ	2	6		
143. Triurideæ	1	1		
144. Alismaceæ	3	3		
145. Naiadaceæ	6	10		
146. Eriocauleæ	1	3		
147. Cyperaceæ	15	166	......	3
148. Gramineæ	67	254	......	1
Lycopodiaceæ	4	12		
Marsileaceæ	2	4		
Filices	50	467	......	52
Dicotyledones	723	2108	4	769
Monocotyledones	273	1340	2	145
Gymnospermæ	6	18	......	1
Cryptogamia (Vasculares)	56	483	......	52

Of the foregoing Orders the Anonaceæ, Sapindaceæ, Myrtaceæ, Rubiaceæ, Verbenaceæ, and Loranthaceæ are greatly in need of revision. The Orchidaceæ have been much sought after for horticultural purposes, but have been described in such a desultory manner that the number of endemic species, though certainly considerable, is very doubtful. The Palmeæ and Pandaneæ are so poorly represented in herbaria, as well as the Bambusaceæ (of which a number are enumerated in the 'Flora de Filipinas'), that, so far as the endemic element is concerned, the figures given must not be taken for much. A number of Grasses, it is true, have been described as endemic; but most of those which I have seen must be referred to more widely spread species. The following Orders enumerated by Villar have been excluded as not indigenous:—Papaveraceæ, Moringeæ, Cacteæ, Pedalineæ, Phytolaccaceæ, Bromeliaceæ, and Irideæ; while Ilicineæ has been added.

It will thus be seen that 119 out of 165 Orders of Dicotyledons are represented, 26 out of 34 of Monocotyledons, and all three of the Gymnospermeæ, the whole Phænogamic vegetation consisting of 3466 species, belonging to 1002 genera. The proportion of Monocotyledons to Dicotyledons is more than one half, a very large proportion indeed if correctly stated, as the proportion in tropical insular vegetation is seldom over one fourth, unless over very limited areas. This proportion will probably be very much reduced as our knowledge of the islands extends. The Gymnospermeæ are poorly represented here, as in the Malayan region generally. The proportion of Vascular Cryptogams to the Phænogamic vegetation is nearly one eighth, chiefly Ferns. There is perhaps no extensive tropical Order of which the distribution is so well known as the Ferns, and moreover the individual species have usually a wider distribution than most plants; yet here we have 52 species not known from elsewhere, or a proportion of over one tenth of the Ferns indigenous to the islands. This alone is sufficient to stamp the islands with a marked individuality. The endemic Phænogamic vegetation consists of 915 species, or a proportion of over one fourth endemic; the Dicotyledons showing a proportion of over one third endemic, and the Monocotyledons of a little over one tenth, which consists chiefly of Orchids. The foregoing figures will doubtless require considerable modification as our knowledge extends: but I believe rather to increase the proportion of endemic species than otherwise, for we know sufficient of the floras of Formosa and Borneo to see that each contains a large number of species distinct from those of the Philippines. To Borneo especially we may look for additional connections. One of the principal reasons why the connection with Borneo is not more marked may be attributed to the fact that it is the southern islands which are so little known—Balabac, Palawan, the Sulu Archipelago, and Mindanao. When these have been well explored the number will probably be very largely increased. Celebes, too, and the Moluccas may be expected to yield several additional connections, more especially with Mindanao. Sufficient, however, is known to show the leading features of the flora; and we may now briefly consider the endemic element in it.

One of the most peculiar features which strike us is the large number of endemic species and the very small number of endemic genera. At present six only of the latter are know from the group. A glance at surrounding islands renders this more apparent. Java has 30 endemic genera, Borneo 28, and Sumatra 14. Further away, we find Ceylon with 17, New Caledonia with 42, New Guinea with 10, and Fiji with 9. One endemic genus only is recorded from Formosa on the north; but the little island of Hong Kong has four. One only is recorded from Celebes; but this island is little known, and more will probably be found. In most of the foregoing islands the proportion of endemic species is not so much in excess of the Philippines, if indeed, some do not actually fall behind them.

Turning to the endemic species we find a number of Orders, represented by a proportion of at least half endemic, as Rubiaceæ, Myrtaceæ, Verbenaceæ, Meliaceæ, Anonaceæ, Myrsineæ, Cyrtandraceæ, Loranthaceæ, Cupuliferæ, Ternstrœmiaceæ, Dipterocarpeæ, Sterculiaceæ, Tiliaceæ, Burseraceæ, Celastrineæ, Connaraceæ, Combretaceæ, Malpighiaceæ, Ochnaceæ, Chailletiaceæ, Vacciniaceæ, Ericaceæ, Aristolochiaceæ, and a few other small Orders. This estimate is based on the material in the Kew Herbarium, not on Villar's enumeration. The only species of *Myrica** yet known is endemic; Ilicineæ has four endemic species out of five, and Proteaceæ has at least three endemic species *.

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* *Myrica luzonica*, S. Vidal, 'Synopsis' (Atlas), p. 40, t. xc. fig. B, is not a *Myrica*. It belongs to Euphorbiaceæ, and may prove to be a species of *Sapium*; but at present only the male flowers are known.

The general and preponderating features of the flora are decidedly Malayan; most of the genera are those which spread over the great Indo-Malayan region, while others are of more restricted range. Thus the Meliaceous genus *Dascycoleum* has four species, two of which are peculiar to the Philippines and two to Borneo; the Verbenaceous genus *Symphorema* has three species, two of which are Indian, the third peculiar to the Philippines. *Alleanthus*, in Urticaceæ, has two species, one peculiar to the Philippines and one to Ceylon. The monotypic genus *Octomeles*, a remarkable genus of Datisceæ, appears to be confined to the Philippines, Borneo, and Sumatra. On the other hand, a large number of typical Malayan genera have not yet been detected in the Philippines, though many of them occur in the neighbouring island of Borneo. This fact is a remarkable one, and points to some peculiar conditions in the past history of the islands. Mr. Wallace attributes the absence of such a large number of widely spread Malayan genera of animals to the large amount of submergence to which the Philippines have undoubtedly been subjected, and their consequent extinction. This, no doubt, is one of the causes; but when the geographical position and peculiar surroundings of the Philippines are borne in mind, it seems probable, and, indeed, almost certain, that a large number both of animals and plants never migrated so far in this direction. The large number of Malayan types present, with the proportion of endemic species, as well as a considerable boreal and Australian element, to be presently noticed, all seem to point to the fact that submergence alone will not account for the present peculiarities, and that the former distribution of land and sea, permitting these successive migrations to reach the islands, while at the same time preventing others, must all be taken into account.

The next striking, and perhaps in some respects the most remarkable, feature in the flora is the presence of a considerable

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* Of the six species of *Helicia* enumerated by Villar one is based on Cuming no. 2338, which is from Malacca, and must consequently be excluded; another sent to Kew as *H. castaneæfolia*, Meisn., is *H. philippinensis*, Meisn., one of the three known endemic species; the remaining one I have not seen. This instance shows the difficulty of estimating the number of endemic species in the face of Villar's identifications.

Australian and Austro-Malayan element. The small Order Stackhousiaceæ consists of eleven species, one endemic in New Zealand, and the remainder all Australian; nine of them endemic, but one (*S. muricata*, Lindl.) occurs also in Luzon, though not yet found in the intervening region. The Liliaceous genus *Thysanotus* has nineteen species, all Australian; but one species also occurs in the Philippines and in China. *Osbornia octodonta*, F. Muell., formerly believed to be endemic in Australia, has now been found indigenous in Luzon, where it is common at Laguimanoc, in the province of Tayabas. Of other Myrtaceous genera are *Xanthostemon* and *Leptospermum*: the former has thirteen species, two of which are endemic in Australia, ten in New Caledonia, and one (*X. Verdugonianus*, Naves) in Mindanao; the latter twenty Australian species, eighteen of which are endemic, one (*L. scoparium*, Forst.) occurring in New Zealand on the one hand, the remaining one (*L. flavescens*, Sm.) through the Archipelago as far as Malacca on the other. *Psoralea* has eleven Australian species, ten of them endemic, the other (*P. badocana*, Blanco) occurring again in New Guinea, Panay, and Luzon. The Epacridaceous genus *Leucopogon* has 118 Australian species, all endemic; two occur in New Zealand, also endemic; and a few others occur in the Malay islands, of which one (*L. suaveolens*, Hook. f.) is peculiar to Borneo and Mindanao. The large Australian Order Proteaceæ is represented by *Helicia*, an outlying genus with about twenty-five species, many of them of very restricted range. The four Australian species are all endemic; Luzon has three endemic species, Java two or three, Ceylon one, Amboyna one, and Japan one; one occurs in China, Hong Kong, and Cambodia, two or three are confined to India, besides which there is some undetermined material from Formosa, Borneo, and Sumatra. This genus shows the western migration most distinctly—from Australia to the Moluccas, Java, Sumatra, Malacca, Ceylon, and India; also the northern one, through Borneo and the Philippines to Formosa and Japan. It must also have occurred at a comparatively remote period, for so large an amount of specific differentiation to have taken place. Again, *Buchnera urticæfolia*, R. Br., is only known from Australia and Luzon; while *Ganophyllum falcatum*, Blume, which occurs in these two places, is found also in the intermediate island of New Guinea. The ditypic Urticaceous genus *Aphananthe* has one species peculiar to Australia and Luzon, the second species being endemic in Japan. There is also a connection with some of the small Pacific islands. *Carruthersia*, in Apocynaceæ, has two species, one endemic in Fiji, the other in Cebu; while *Polypodium simplicifolium*, Hook., and *Asplenium Brackenridgei*, Baker, are only known from the Philippines and Fiji. *Garuga mollis*, Turcz., is only known from the Philippines and Samoa; while *Davallia repens*, Desv., occurs only in the Philippines, Samoa, and Fiji. *Melia Candollei*, A. Juss., and *Vitex littoralis*, Decne., are only known from the Philippines and Timor; *Asplenium persicifolium*, J. Sm., from the Philippines and Sandwich Islands; while the Urticaceous genus *Paratrophis* has four species, one endemic in New Zealand, another in Tahiti, a third in Fiji, and a fourth (*P. philippinensis*, F. Villar) in Luzon.

A connection with New Guinea has already been detected, though so little is yet known of this large island. *Schizocasia*, in Aroideæ, has two species, one confined to the Philippines, the other to New Guinea; while *Odina speciosa*, Blume, *Epithema Benthami*, Clarke, and *Asplenium scandens*, J. Sm., are peculiar to New Guinea and the Philippines. Species which are at present only known from the Philippines and Australia may be expected to occur in this intermediate area.

The northern element now remains to be noticed, and although not extensive, it will be seen to be of a very marked character. *Isanthera discolor*, Maxim., is peculiar to Formosa and Luzon; *Croton Cumingii*, Muell. Arg., is peculiar to Luzon, Formosa, and the Loo Choo Islands; *Vernonia philippinensis* is an endemic species closely allied to *V. Cumingiana*, Benth., a peculiar Hong-Kong species; *Ligustrum Cumingianum*, Decne., also endemic, is closely allied to a group of Chinese species; *Scutellaria luzonica* is an endemic species whose nearest ally seems to be *S. indica*, L., a species reaching from the Himalayas to Japan; *Ophiopogon spicatus*, Ker, reported as indigenous, but of which I have not seen a specimen, is a native of the same region. There are also three endemic species of *Carex* (*C. fibrata*, Boott, *C. Cumingii*, Boott, and *C. Cumingiana*, Steud.), a typical northern genus. The same may be said of the genus *Pinus*, represented here by *P. insularis*, Endl., and *P. Merkusii*, Jungh.—the former endemic in the province of Nueva Ecija, in north-eastern Luzon; the latter believed to be limited in Luzon to the province of Zambales (also on the eastern coast, but further south), but occurring again in Sumatra. *Lilium Wallisii*, Baker, and *Viburnum luzonicum*, both endemic in Luzon, are outlying species, closely allied to others from the opposite Chinese coast, where, and in Japan, both genera are well represented. *Clerodendron intermedium*, Cham., from Luzon, is closely allied to a Formosan species, and again to a species from Celebes but the material is not sufficient to prove their identity. *Guettardella* has one species endemic in Bohol, another in Hong Kong, and a third in Australia; this genus, however, is now made a section of *Antimonius*, a more widely diffused genus: so that the two last-named examples may be taken to represent northern outliers of Malayan genera which have extended through the Philippines. *Clerodendron* is strongly represented here, having nine endemic species. *Lactuca brevirostris*, Champ., occurs in Luzon, Formosa, Hong Kong, China, Japan, and Northern India.

To return now to the Malayan element, we may trace the connections with the principal Malay islands. First, then, from its position we should suspect that Borneo would have the closest affinity with the Philippines. This, I believe, will prove to be the case; but at present its flora is very imperfectly worked out. *Dasycoleum*, with two Bornean and two Philippine species, has already been mentioned; also *Leucopogon suaveolens*, Hook. f.; the latter confined to Borneo and Mindanao. Besides these, *Myristica guatteriæfolia*, A. DC., formerly only known from the Philippines, has now been found in the little island of Labuan off North-east Borneo (Mottley 139). *Dipterocarpus grandiflora*, Blanco, *Pipturus asper*, Wedd., *Cyrtopera squalida*. Reichb. f., and *Lindsaya concinna*, J. Sm., are also limited to Borneo and the Philippines.

Of Celebes so little is known that it would be difficult as yet to point out many very clear affinities; some, however, undoubtedly exist. *Semecarpus Perottetii*, March, *Aglaia macrobotrys*, Turcz., and *Momordica ovata*, Cogn., are only known from Celebes and the Philippines; but besides these a number of plants, collected at Gorontalo by Mr. Riedel, are either identical with, or closely allied to, Philippine species, but they require more thoroughly working up.

Java is better known than any of the Malayan islands, and has a considerable affinity with the Philippines. *Pangium edule*, Reinw., formerly considered endemic in Java, has now been found in the Philippines. *Rhododendron javanicum*, Blume, *Andrachne australis*, Zoll., *Antidesma montanum*, Blume, *Phyllanthus buxifolius*, Muell. Arg., *Conocephalus ovatus*, Trécul, *Asplenium anisodontum*, Presl, *A. woodwardioides*, Baker, *Polypodium papillosum*, Blume, and *Helionitis Zollingeri*, Kurz, are at present only known from Java and the Philippines; the last-named, if correctly localized, is from the island of Panay. Again, *Aglæonema simplex*, Blume, occurs in Java, and again in the small island of Malamaui, close to Basilan Island, south of Mindanao in the Sulu Archipelago.

Sumatra has a considerable number of Philippine plants which occur over a limited area, besides which *Pothos inæquilaterus*, Presl, *Pinus Merkusii*, Jungh., and *Davallia decurrens*, Hook., are at present only known from Sumatra and the Philippines; while *Octomeles sumatrana*, Miq., from Sumatra, Borneo, and the Philippines, has not yet been found in Java.

Litsea cinnamomea, Blume, originally described from Ternate in the Moluccas, has now been found in Luzon; *Procris grandis*, Wedd., from Samar*, has been found in Buru; *Cyathea integra*, J. Sm., is peculiar to the Philippines and Amboyna; *Nephrodium obscurum*, Hook., to the Philippines and Tavoy; *Polypodium splendens*, Hook., to the Philippines and Singapore; and *Lygodium hastatum*, Desv., to the Philippines and Marianne Islands.

Several species appear to be peculiar to the Philippines and the Malay Peninsula, as:—*Lindsaya scandens*, Hook., *Pteris ludens*, Wall., *Nephrodium crassifolium*, Hook., *Polypodium sessilifolium*, Hook., *P. stenophyllum*, Blume, *P. longifolium*, Mett., *P. palmatum*, Blume, and *Nephrodium giganteum*, Baker; while *Asplenium sorsogonense*, Presl, and *Polypodium flaccigerum*, Mett., extend to the Himalayas. The Indian connection is also seen in *Asplenium Wightianum*, Wall., *Nephrodium recedens*, Hook., and *N. Otaria*, Baker, which at present are only known from the Philippines,

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* Weddell (Monogr. Urtic. p. 337) says:—"Hab. In Nova Guinea?—(v. s. in Herb. Hook.)". The only specimen in Herb. Hook. is Cuming n. 1730, from the island of Samar; on this sheet Weddell himself has written "Procris grandis, Wedd.;" consequently it is the type. I cannot account for the locality given unless Weddell accidentally omitted to copy it at the time, and supplied it from memory (with the "?") afterwards, when he had not the sheet to refer to. A plant collected by Riedel at Buru, in the Moluccas, appears to be the same species, though the cyme is a little more pubescent.

Ceylon, and India; while, on the other hand, a large number of species which are scattered about the Malayan Islands do not reach India.

Besides a number of species mentioned earlier in this paper, the connection between China and Formosa and the tropical Malayan Islands by way of the Philippines is supported by *Alsophila tomentosa*, Hook., and *Polypodium lomarioides*, Kunze, which occur in Formosa on the one hand and in the Malay Islands on the other, the former limited to Java in the south. There are also several species which are scattered about the Polynesian Islands, occurring both in Java and the Philippines, but not found further westward.

So little is known of a considerable number of the islands that little can be said of them individually, but from what few indications we have it may safely be inferred that many interesting problems of distribution will yet come to light. The Sulu Archipelago, the islands between Mindanao and Celebes, also the islands of Balabac and Palawan, are all likely to yield connecting links with Celebes and Borneo. Between Luzon and Formosa the islands are so small that the connecting links are less likely to have survived the changes which must have taken place since the period when the migration southward occurred—probably during the cold of the Glacial Epoch. Mindanao has the highest mountain in the group, the volcano of Apo reaching to over 8000 feet. *Xanthostemon Verdugonianus*, Naves, and *Gyrinopsis Cumingiana*, Decne., are endemic here; while *Leptospermum flavescens*, Sm., and *Leucopogon suaveolens*, Hook. f., are not known from further north.

Leyte is separated from Mindanao by the Surigao Straits; it is about a twelfth as large as Luzon. Cuming collected some plants here, of which *Ilex philippinensis*, *Melastoma pencillatum*, Naud., and *Osmelia conferta*, Benth., have not yet been found elsewhere. Samar lies to the east, a little north, and is slightly larger than Leyte; it is separated from it by the very narrow San Juanico Straits, while the San Bernardino Straits separate it from the southern point of Luzon. Of the plants collected here by Cuming, *Grewia eriopoda*, Turcz., *Begonia quercifolia*, A.DC., *Osmelia philippinensis*, Benth., *Buchanania nitida*, Engl., *Lepidagathis laxa*, Nees, *Dracontomelum Cumingianum*, Baill., and *Cyclostemon Cumingii*, Baill., are only as yet known from Samar.

Bohol lies south of Leyte, near to Mindanao, and is about as large as Leyte. Of plants collected here by Cuming, *Ryssopteris microstemma*, A. Juss., *Guettardella philippinensis*, Benth., *Melodinus Cumingii*, A. DC., *Æschynanthus philippinensis*, Clarke, *Eria vulpina*, Reichb. f., *E. retroflexa*, Lindl., *Arundina speciosa*, Lindl., *Calanthe conspicua*, Lindl., and *Cypripedium Argus*, Reichb. f., are not known from elsewhere. Cebu is a long narrow island north-west of Bohol, and slightly smaller. Cuming also collected here, and of his plants *Kayea philippinensis*, Planch., *Ryssopteris dealbata*, A. Juss., *Carruthersia pilosa*, F. Villar, and *Carex fibrata*, Boott, are not yet found elsewhere. Negros is separated from Cebu—which lies almost parallel to it—by the Tanon Straits; it is about as large as Samar, and contains a volcanic mountain 7500 feet high. Cuming visited the island, and of the plants obtained by him *Carex Cumingiana*, Steud., and *Voacanga Cumingiana* appear to be endemic. Panay lies north-west of Negros, and about equals it in size. Cuming collected some plants here; a few also occur in Vidal's collection. Of these *Utricularia rosulata*, Benj., is not known from elsewhere.

The island of Luzon has been considerably explored, though some parts of it are very little known, especially the Pacific side of the northern half of the island; but sufficient data have been collected for a brief outline of its physical conditions and vegetation. Commencing at the southernmost point, we find Bulusan, the most active volcano in the island, reaching to 5000 feet; a little further north is Sorsogon: then comes Mayon, a less active volcano, barren at the summit, and reaching to over 7000 feet above sea-level. Still going northward we come to Iriga, reaching 5000–6000 feet, and clothed almost to the summit with vegetation; and then to the quiescent volcano of Isarog, 6000 feet high. Just to the north of this is a depression running right across the island, and consisting entirely of raised coral-reefs. Before the period of elevation set in, this formed a separate island. North-east of this is Labo, nearly 5000 feet high; and a little further on in the same direction a bay may be seen on either coast, the intervening area consisting of raised coral-reefs. This also marks the limit of a former separate island, of which the previously mentioned reef formed the southern limit. This district, reaching to the southern point of Luzon, is the province of South Camarines. Some of the endemic species of the island are confined to this province, doubtless owing to their former isolation. It is also interesting to notice that the volcanic activity gradually increases southward to the extreme point, showing which way the subterranean forces are moving. North of this second depression the mountains rise again, and may be traced in an irregular line for quite half the remaining distance to the northern point of the island, when they fork, and are continued in two distinct branches, the volcano of Cagua, at the extreme northern point on the eastern branch, reaching over 3500 feet above sea-level. The Pacific side of the island is much moister than the opposite or western side, and the different zones of vegetation on the mountains descend much lower. In the damp dense forests of this Pacific coast a considerable number of Palms occur; but the rainfall is so heavy, and the natives so hostile in many parts, that comparatively little has been collected. On the contrary, the western side has been considerably explored; the forests are dense, but drier than those of the Pacific coast. The genus *Pinus* is confined to this western side, the endemic *P. insularis*, Endl., occurring in the province of Nueva Ecija, and not found further south than 15° north latitude. *Pinus Merkusii*, Jungh., is found further south, in the province of Zambales, in a somewhat restricted area, but occurs again in the island of Sumatra. The greater part of the northern element also is limited to this western district, some of the species only occurring in the north of the island. The general character of the vegetation is similar to that of the other Malay islands; large dense forests cover the lower elevations. Anonaceæ, Guttiferæ, Sterculiaceæ, Tiliaceæ, Rutaceæ, Burseraceæ, Meliaceæ, Sapindaceæ, Leguminosæ, Myrtaceæ, Rubiaceæ, Verbenaceæ, Euphorbiaceæ, Urticaceæ, and Palms are all abundant; while a considerable number of other Orders are also well represented. Dipterocarpeæ and Sapotaceæ are chiefly gigantic trees occurring deep in the forests. Climbing-plants are abundant—Menispermaceæ, Phytocreneæ, Ampelideæ, Cucurbitaceæ, and the genus *Calamus* of the Palms being the principal ones. The epiphytal Orchids are also very numerous; and in the Mangrove-swamps (occupying a considerable area) Loranthaceæ are abundant. Ascending a short distance up the mountains, Ternstrœmiaceæ, Melastomaceæ, Myrsineæ, and Cupuliferæ are well represented, together with a number of smaller Orders. Towards the summit a veritable mountain flora is found, including several species of Ericaceæ and Vaccineæ. *Gunnera macrophylla*, Blume, hitherto known only from Java and Sumatra, has recently been discovered, occupying a considerable area at the extreme summit of the extinct volcano of Banahao. Herbaceous plants are tolerably numerous, a few Orders (as Cyrtandraceæ) having a considerable proportion of endemic species, but for the most part consisting of widely diffused plants. To these may be added a few mere weeds of cultivation, and accidentally introduced plants. *Argemone mexicana*, L., is now a great pest. *Muntingia Calabura*, L., an American plant of recent introduction, is now spreading rapidly. *Dalea nigra*, Mart. et Gal., is a Mexican plant, now very abundant. This plant is probably an introduction of very ancient date, brought by shipping at the time when Spain annually sent ships direct from Mexico to the Philippine Islands, more than one of which was captured by English sea-captains in those disturbed times. *Prosopis juliflora*, DC., occupies a large area round the Bay of Manila, but is evidently an American introduction, although nothing is known of it except that it is now so abundant as to appear truly indigenous. *Carica Papaya*, L., is an American introduction of the 17th century. There are also several other American plants, of which all traces of the introduction are completely lost, besides a number of plants of yet older introduction. Before the islands were taken possession of by the Spaniards, successive Malayan invasions took place, and with these were introduced many of the fruit-bearing trees and other plants which are universally cultivated throughout the whole Malayan Archipelago.

The more characteristic features of the flora have now been traced; and it remains to be seen how far this will help us in arriving at its origin and in tracing the past history of the islands. It is probable that during the period while the present genera were becoming differentiated, a considerable portion of the islands was under water. The fact that nearly all the genera have their headquarters to the south and south-west, as well as the absence of such a large number of typical Malayan genera, both point to the fact that the flora did not originate where it now exists, but reached its present location by migration northward. The paucity of endemic genera also tends to confirm this view. Whether previous to this period the Philippines formed part of the great

Asiatic continent or not, there does not seem sufficient evidence to show; but at length a period of elevation set in, owing to volcanic agency; the ancient sea-bottom emerged from beneath the water, and the subterranean forces burst through the sedimentary rocks, burying them with the ejected scoriæ and lava. A considerable period would be required for this process; and it is evident that at length the islands—probably very different in configuration and extent from what they are now—became connected in some degree with the land which undoubtedly existed to the southward, and where the typical Malayan flora probably originated. Meantime a more complete connection through the Archipelago than at present had been favouring a migration from Australia westward. The then existing species gradually migrated northward through the Philippines, some reaching Mindanao, others Luzon, and some passing through to Formosa, a few of which even extended to Japan by way of the Loo Choo Islands. Some others appear to have spread across from Formosa to South China and Hong Kong, as *Thysanotus chrysantherus*, F. Muell., the only outlying species of a genus all Australian and with eighteen others endemic in Australia. It is not necessary to assume that the Australian and Malayan migrations were contemporaneous, or that they passed over by one single connection; on the contrary, a few species seem to have reached the Philippines by direct communication with the Moluccas, at a time when circumstances did not allow them to reach either Java or Borneo. The typical Malayan genera, however, seem to have passed direct through Borneo, and perhaps some from Borneo itself. Besides these connections there are evidences of a former direct connection with the north-eastern point of Celebes, by way of a sunken reef, of which a few small islands are now the only remaining trace. In support of this view it may be noted that the volcanoes of Celebes are confined to the north-eastern portion; and it seems probable that the islets stretching away to the south-eastern point of Mindanao are only volcanic connections between the two. The present condition of the volcanic forces in the Philippines probably differs only in intensity from that of the past; and, if this view be correct, it is evident that periodical eruptions have taken place since the time of their emergence; these eruptions having been to a great extent local, sometimes in one locality, sometimes in another, but formerly of gigantic dimensions,—as is proved by the enormous volcanic mountains everywhere to be found throughout the group. During these upheavals, with accompanying subsidences in adjacent areas, it is probable that the various islands were severed and reconnected in different directions, not only with adjacent regions, but with each other, and that the various plants and animals diffused themselves about as circumstances permitted, the various connections serving as stepping-stones from one island to another. Possibly they were once more continuous; but, on the other hand, the island of Luzon was formerly cut into three, and there is abundant evidence to prove that the southern portion was long separated from the northern. Coral-reefs, too, abound in various directions throughout the group, and afford certain evidences of former submersion; but it seems probable that these subsidences were of a local nature rather than a recent general subsidence, which must have destroyed a large portion of its endemic vegetation.

At the time when the land-connection with the Chinese region permitted a partial migration northward, a certain commingling of the two floras took place, some of the Chinese plants moving southward. After a considerable period of stability this southward migration was probably hastened by the cold of the early Glacial Period, during which the connections were being gradually severed, some of the species reaching Formosa, some the northern part of Luzon, and others getting still further southward. The connections to the southward were also being severed; and thus the various plants and animals became isolated, some of them with a wide dispersion within the group, and others with a considerably restricted range. A period of comparative stability at length set in, which has continued down to the present time; and during this period of long isolation the species have become modified into distinct local species, some of them having a very restricted range within the group. And, lastly, since the period when the connections with surrounding countries were cut off, a number of additional plants have reached the islands—by marine currents and other causes known to effect the dispersion of plants, and by man's agency—some of which are so thoroughly established or so widely diffused as to appear truly indigenous.

Mr. Wallace, in 1876 ('Geographical Distribution of Animals,' vol. i. p. 344), speaking of the Philippines, remarked:—"They are, in fact, truly insular, while the other [Malay] islands are really continental in all the essential features of their natural history." He also says (p. 346):—"We find apparently two sets of animals—a more remote series . . . in which the species are distinct from any others, and a more recent series . . . identical with common Malayan animals. The former indicate the earliest period when these volcanic islands were connected with some part of the Malayan subregion. . . . The latter may indicate either the termination of the period of union or merely the effects of introduction by man. The reason why a larger number of mammalian forms were not introduced and established was probably because the union was effected only with some small islands, and from these communicated to other parts of the Archipelago; or it may well be that later subsidences extinguished some of the forms that had established themselves." Four years later ('Island Life,' p. 361) he gives a somewhat different explanation of the peculiar phenomena; he says:—"It is evident that the Philippines once formed part of the great Malayan extension of Asia, but that they were separated considerably earlier than Java. . . . The reason of their comparative poverty in genera and species of the higher animals is, that they have been subjected to a great amount of submersion in recent times."

If the Philippines had once formed part of the great Malayan extension of Asia, which was separated earlier than Java, it would have required an almost total submersion to have caused such wholesale extinction of typical Malayan tribes and genera; while, on the other hand, many of the survivors are not more fitted, and some much less so, to survive such a submersion, than many of those believed to be absent at the present time. Geological evidence will probably in future throw much light on this point. Meantime the present evidence appears to support the former of these two opinions. It has been shown that nearly all the genera have their headquarters elsewhere, the few which are endemic being principally monotypic and closely allied to those of surrounding countries; thus proving that the present flora has been chiefly or altogether derived from these sources, and is consequently of more recent origin, and that in many cases the lines of migration can easily be traced. It has also been shown that, with the exception of a large number of species of very wide distribution, or that have been directly or indirectly introduced by human agency, this migration (which occurred after a period of stupendous volcanic upheaval) was sufficiently remote to allow of a large amount of specific modification under altered circumstances; also that with the waning of the volcanic forces a period of comparative stability set in, allowing a limited amount of specialization in the different islands themselves. I think it will therefore be conceded that the foregoing outlines show that the Philippines are truly insular in the essential features of their natural history; not so much through being an early separation of the Asiatic continent which has since had a dip under the sea, as through their being largely of volcanic—and, geologically, of somewhat recent—origin, as in the case of other islands of admitted oceanic origin.

The following alterations, with descriptions of a few novelties, have been made during a study of the Philippine collections. A number of additions to Villar's 'Novissima Appendix' had been written out, also species included by error, or that will have to be reduced as synonyms, had been indicated; together with a few erroneously reduced synonyms, or that will have to be transferred to other species; but as in the absence of a complete set of authentic specimens the Appendix would still be incomplete, it has been thought better to suppress them, at least for the present, though they are taken account of in estimating the numbers for the foregoing Census.

Dilleniaceæ.

Dillenia philippinensis, *Rolfe.*—D. indica, *Blanco, Fl. Filip.* ed. 1, p. 472; ed. 3, vol. iv. *Nov. App.* p. 3; *non* L.—D. speciosa, *Blanco, l.c.* ed. 2, p. 329; ed. 3, vol. ii. p. 244, tab. 199; *non Thunb.*—Riefferschiedia?, *Llanos in Mem. de la Rl. Ac. de Cienc. de Mad.* iv. ser. 3, tom. ii. part 3, p. 508. Nom. vern. "Catmon." Differs from *D. indica*, L., in the shorter, more elliptical leaves without attenuate bases, the much fewer and more distant nerves, and other characters.

Magnoliaceæ.

Talauma Villariana, *Rolfe.*—T. mutabilis, *F. Villar, in Blanco, Fl. Filip.* ed. 3, vol. iv. p. 3, tab. 148, excl. syn., *non Blume.* Differs from *T. mutabilis*, Blume, in the more numerous, more oblique nerves, longer buds and sepals, and other characters.

MALVACEÆ.

THESPESIA CAMPYLOSIPHON, *Rolfe.*—Hibiscus campylosiphon, *Turcz. in Bull. Soc. Nat. Mosc.* xxxi. pt. 1, p. 193; *F. Villar, l. c.* p. 25.—H. Vidalianus, *Naves, in Blanco, Fl. Filip.* ed. 3, t. 333.—H. grewiæfolius, *F. Villar, l. c.* p. 24, *excl. syn. plur., non Hassk.* F. Villar enumerates this species twice; once wrongly referring it to *H. grewiæfolius*, Hassk., which has not been found in the Philippines, and must therefore be excluded.

STERCULIACEÆ.

STERCULIA BLANCOI, *Rolfe.*—S. alata, *Blanco, Fl. Filip.* ed. 2, p. 525; ed. 3, vol. iii. p. 165; vol. iv. *Nov. App.* p. 27, t. 401; *non Roxb.*

TILIACEÆ.

COLUMBIA BLANCOI, *Rolfe.*—C. floribunda, *Naves in Blanco, l. c.* ed. 3, t. 312; *F. Villar, l. c.* vol. iv. *Nov. App.* p. 30, *non Wall.* This plant is referred to *C. floribunda*, Wall., which has five primary nerves and is otherwise different. It must be excluded.

ILICINEÆ.

Of this Order, not yet recorded from the Philippines, the following species are known:—

ILEX CYMOSA, *Blume.*—Luzon, Mt. Caraballo, 2000 ped. alt.; *S. Vidal* n. 434!

I. CUMINGIANA, sp. nov.—Rami glabri teretes, foliis oblongis acuminatis integris, basi cuneatis coriaceis nitidis, venis obliquis, paniculis terminalibus quam folia duplo brevioribus, calycis lobis triangularibus, corollæ tubo brevi, segmentis ovato-oblongis, staminibus petalis æqualibus, ovario glabro, stylo bipartito, stigmatibus simplicibus; fructu ignoto.

Luzon, Prov. Albay, *Cuming* n. 1241!

Leaves 3–4½ by 1¼–1¾ in., petioles ½–¾ in.; primary nerves about nine pairs, a little prominent on both sides. Panicles 2 in. long, somewhat lax. Flowers 2 lin. in diameter.

I. PHILIPPINENSIS, sp. nov.—Rami glabri teretes, foliis late ellipticis abrupte acuminatis, integris, basi obtusis coriaceis, venis patentibus, cymis axillaribus multifloris quam folia vix brevioribus, calycis lobis triangularibus, corollæ tubo brevi, segmentis ovato-oblongis, staminibus petalis excedentibus, ovario glabro, stylo breviter 3-fido, stigmatibus crassiusculis; fructu ignoto.

Philippines, island of Leyte, *Cuming* n. 1748!

Leaves 2–3 by 1½–2 in., petioles 4–6 lin.; primary nerves 7–10 pairs, a little prominent on both sides. Cymes 2 in. broad and nearly as long, dense. Flowers 2 lin. in diameter.

I. LOBBIANA, sp. nov.—Rami tetragoni dense rufo-pubescentes, foliis elliptico-ovatis obtusis crenulatis coriaceis nitidis, venis obsoletis, cymis axillaribus brevibus, calycis lobis rotundatis, corollæ tubo brevi, segmentis rotundato-ovatis, staminibus petalis fere æqualibus, stigmate sessili; fructu ignoto.

Luzon, *Lobb*!

Leaves 1–1¼ in. by 7–9 lin. petioles 2–3 lin. Cymes ⅓ in., few-flowered. Peduncles 2 lin. Flowers 2 lin. in diameter.

I. LUZONICA, sp. nov.—Rami angulati subalati glabri, foliis ellipticis obtusis crenulatis basi cuneatis coriaceis, stipulis lanceolatis, floribus ignotis, sed pedunculis axillaribus, medio bibracteolatis supra crassiusculis, calycis lobis late rotundatis, fructibus globosis, stylo brevi integro, stigmate capitato.

Luzon, *Lobb*! Centre of Luzon, *S. Vidal*, n. 66!

Leaves 6–11 by 4–5 lin., petioles 1 lin. Fruiting peduncles 5 lin. Fruits 2–2½ lin. in diameter.

Readily distinguished from the last by the glabrous, almost winged branches and smaller leaves.

SAPINDACEÆ.

ZOLLINGERIA TRIPTERA, *Rolfe*.—Melicocca triptera, *Blanco, l. c.* ed. 2, p. 203; ed. 3, vol. ii. p. 16.—Z. macrocarpa, *F. Villar, l. c.* p. 53; *S. Vidal, Synopsis*, t. 35. fig. C; *non Kurz*. This species is distinct from *Z. macrocarpa*, Kurz, which must be excluded.

LEGUMINOSÆ.

[Dalea nigra, *Mart. et Gal.*—D. alopecuroides, *Blanco, l. c.* ed. 2, p. 389, ed. 3, vol. ii. p. 251; vol. iv. *Nov. App.* p. 58, *excl. syn.*; *non Nutt.*—The plant referred to *D. alopecuroides*, Nutt., is this species; but all the synonyms except that of Blanco must be excluded. It is a Mexican plant, introduced long ago, probably by shipping, and now very abundant.]

PTEROCARPUS VIDALIANUS, *Rolfe*.—P. erinaceus, *F. Villar, l. c.* vol. iv. *Nov. App.* p. 68, *excl. syn.*; *S. Vidal, Synopsis*, t. 40. fig. B, *non Poir.* A most distinct species.

CRUDIA BLANCOI, *Rolfe*.—C. spicata, *Blanco, l. c.* ed. 2, p. 261 ed. 3, vol. ii. p. 121; vol. iv. *Nov. App.* p. 71, t. 244, *excl. syn.*; *non Willd.* Hitherto confounded with an American species.

Combretaceæ.

Terminalia Calamansanay, *Rolfe*.—Gimbernatia Calamansanay, *Blanco, l. c.* ed. 2, p. 266; ed. 3, vol. ii. p. 129.—T. bialata, *F. Villar, l. c.* p. 80, *excl. syn. plur., non Kurz.* This species is distinct from *T. bialata*, Kurz, which must be excluded.

Melastomaceæ.

Carionia triplinervia, sp. nov.—Rami teretes glabri, foliis lanceolato-ellipticis breviter acuminatis triplinerviis coriaceis glabris, cymis terminalibus 5-floris, floribus bracteolatis, calyce campanulato, lobis 6 minutissimis acutis, petalis 6 contortis obovatis, staminibus ovarioque ut in generibus; fructu ignoto.

Luzon, Volcano Mayon, Prov. Albay, 5100 ft. alt.; *S. Vidal*, n. 779!

Leaves 1½–2¼ by ¾–1 in., petiole ¼ in. Peduncles 1½ in., pedicels ¼ in., with 4–6 peculiar and extremely narrow linear bracteoles, ½ in. long, at their bases. Calyx 4 lin. long. Petals 8 lin. long.

I have not seen a specimen of *C. elegans*, Naud., the type of the genus, but the floral structure agrees with Naudin's description and figure. It is, however, evident that this is a second species, for Naudin describes the leaves of his plant as "quintuplinerviis," and the cymes as "3-floris aut paucifloris." Naudin does not mention anything about bracteoles in his plant, and the figure represents the calyx-lobes as over a line long, while in the present species they are excessively minute.

Araliaceæ.

Panax Cumingiana, *Rolfe*.—Paratrophia Cumingiana, *Presl, Epim. Bot.* p. 250.—Polyscias Cumingiana, *F. Villar, l. c.* p. 102, *excl. syn.* F. Villar refers this plant to *Polyscias*, but it must go to *Panax*.

Caprifoliaceæ.

Viburnum luzonicum, sp. nov.—Rami teretes ferrugineo-tomentosi, foliis ovatis acuminatis denticulatis v. subintegris, junius utrinque rufo-tomentosis demum supra puberulis, cymis terminalibus densis rufo-tomentosis, calycis lobis brevibus rotundato-ovatis, corollæ tubo brevissimo, lobis oblongis extus pubescentibus, staminibus styloque brevibus, stigmate capitato, fructu ovoideo compresso.

Luzon, Prov. Albay, *Cuming* n. 1345!

Leaves 2–3 by 1–1½ in.; veins 5–7 pairs, very oblique; teeth small and distant, sometimes almost obsolete; petioles ¼ in. Cymes 1½–2 in. diam. Flowers 1 lin. Fruit 2½–3 lin.

RUBIACEÆ.

MUSSÆNDA GRANDIFLORA, *Rolfe.* — Calycophyllum grandiflorum, *Meyen, Reise*, ii. p. 234; *Walp. in Pl. Meyen.* p. 356.— M. frondosa, *Blanco, l. c.* ed. 1, p. 167; ed. 2, p. 118; ed. 3, vol. i. p. 211; vol. iv. p. 107, t. 58, *excl. vars.*; *non L.* The varieties enumerated by F. Villar scarcely belong here. It is doubtful, however, if they belong to *M. frondosa*, L., as I have not yet seen this species from the Philippines.

VILLARIA, gen. nov.—Calycis tubus infundibularis; limbus 5-dentatus. Corolla hypocraterimorpha, fauce villosissima; limbi lobi 5, patentes, breves, stricte contorti. Stamina 5, fauci corollæ inserta, filamentis brevissimis; antheræ subsessiles, dorso affixæ, lineares, utrinque acutæ, inclusæ. Discus annularis, parvus. Ovarium 1-loculare; stylus basi gracilis, apice fusiformis, villosissimus, vertice integro; ovula 4–8 in utraque placenta, horizontalia; placentis 2 parietalibus. Fructus ignotus.—Frutex glaber, inermis, ramulis teretibus. Folia opposita, coriacea. Stipulæ intrapetiolares, triangulares, persistentes. Cymæ axillares, pedunculatæ, pauci- v. multifloræ. Bracteæ triangulares, basi connatæ. Flores parvi.

V. PHILIPPINENSIS, sp. unica.—Frutex glaber, ramo tereti, foliis elliptico-oblongis, breviter acuminatis, integris, coriaceis, basi cuneatis, 2–3 poll. longis, 1–1¼ poll. latis, petiolo ¼ poll. longo, pedunculis gracilibus, 1–1½ poll. longis, pedicellis 1 lin. longis, calyce 4 lin. longo, lobis rotundatis brevbius, corollæ tubo 2 lin. longo, lobis rotundato-ovatis. (Plate X. figs. 1–8.)

Hab. Minalabat, Luzon, *S. Vidal* n. 836! Nom. vern. "Lasgas."

The position of this genus appears to be next to *Gardenia*, with which it agrees in its one-celled ovary; it is also much allied to some of the immediately following genera, but the ovary and other characters readily distinguish it from them. Since the above was written I have seen some additional material belonging to the genus. Cuming n. 874, from Prov. Albay, Luzon, is a vigorous branch with broader stipules, larger leaves, and longer cymes, but apparently otherwise quite identical with the foregoing. Cuming n. 1271, from the same locality, is a vigorous branch with very broad stipules, obovate, very obtuse leaves with cuneate bases, 4–5 in. long by 2½–4 in. broad, short cymes only one third as long as the leaves, and slightly larger flowers; but I suspect it will prove to be only a form of the above, and not a distinct species. Neither of these plants is in the Kew Herbarium. The genus is named in commemoration of Father Fernandez Villar, to whose energy we are largely indebted for the third edition of Blanco's 'Flora.'

ANTIRRHŒA PHILIPPINENSIS, *Rolfe*.—Guettardella philippinensis, *Benth. in Hook. Kew Journ.* iv. p. 197.—Antirrhæa sp., *F. Villar, l. c.* p. 109. This is enumerated without a specific name.

PSYCHOTRIA TACPO, *Rolfe*.—Pœderia Tacpo, *Blanco, l. c.* ed. 1, p. 160; ed. 2, p. 113; ed. 3, vol. i. p. 202, t. 55.—P. malayana, *F. Villar, l. c.* p. 112, *excl. syn. plur., non Jack*. Blanco's plant is referred by Villar to *P. malayana*, Jack, which is distinct, and must be excluded.

COMPOSITÆ.

VERNONIA PHILIPPINENSIS, sp. nov.—Fruticosa, ramulis ferrugineo-tomentosis striatis teretibus, foliis petiolatis elliptico-oblongis acuminatis, basi cuneatis, supra puberulis, subtus tomentosis, paniculis terminalibus amplis, capitulis pedicellatis circa 32-floris, involucro globoso squamis ovatis interioribus oblongis obtusiusculis, achænio pubescenti 10-striato, pappi setis rufis quam involucrum duplo longioribus.

Luzon, Prov. Albay, *Cuming* n. 1092!

This species is much allied to *V. Cumingiana*, Benth., in Kew Journ. of Bot. iv. p. 233, from Hong Kong, with which the Indian *V. Andersoni*, Clarke, has been identified; but differs in the broader heads with more numerous flowers, also in the more striate branches, narrower leaf-bases, and the more pubescent, less strongly striate achenes.

These two species have been, and still are, somewhat confused. Bentham, in his "Florula Hongkongensis," published in the 'Kew Journal of Botany,' *l. c.*, in describing the Hong-Kong plant, gave the specific name *Cumingiana*, on the assumption that the Philippine plant was identical. Hooker (Fl. Brit. Ind. iii. p. 241), in identifying the Hong-Kong plant with *V. Andersoni*, Clarke (Comp. Ind. p. 27), says:—" *V. Andersoni*, Clarke, *V. Cumingiana*, Benth., Fl. Hong Kong, p. 170, not of Kew Journ.

Bot. iv. p. 233. Bentham is mistaken in referring the Hong-Kong plant to his *V. Cumingiana* of the Philippines." But both Bentham's descriptions are made from the Hong-Kong plant, and his name must consequently supersede *V. Andersoni*, which is more recent. The Philippine plant, until now undescribed, may be called *V. philippinensis.*

BLUMEA TETRAPTERA, *Rolfe.*—Conyza tetraptera, *Turcz. in Bull. Soc. Nat. Mosc.* 1851, pt. 1, p. 178.—*F. Villar, l. c.* p. 115. This plant must go to *Blumea.*

APOCYNACEÆ.

VOACANGA CUMINGIANA, sp. nov.—Rami glabri, foliis obovato-oblongis abrupte breviterque acuminatis, basi attenuatis, glabris, cymis 3-floris breviter pedunculatis, calyce tubuloso segmentis rotundatis, corollæ tubo angusto, segmentis rotundato-ellipticis patentibus, stigmatibus styloque inclusis.

Island of Negros, Philippines, *Cuming* n. 1806!

Leaves 2–4 by 1–1½ in., veins spreading about 6 pairs, petiole 6–7 lin. Peduncle and pedicels ½ in. long. Calyx 1 in., its lobes 1 lin. long. Corolla-tube 1½ in., lobes 1 in. long. A marked species; but as the two specimens are small I have not dissected a flower to examine the stamens &c.

ICHNOCARPUS NAVESII, *Rolfe.*—I.? frutescens?, *Naves in Blanco, l. c.* ed. 3, tab. 97, *non R. Br.*—I. ovatifolius, *F. Villar, l. c.* p. 131, *non R. Br.* Villar refers this plate to *I. ovatifolius*, A. DC., but it is quite distinct.

KICKXIA BLANCOI, *Rolfe.*—Anasser floribus axillaribus solitariis, *Blanco, l. c.* ed. 1, p. 114; ed. 2, p. 81; ed. 3, vol. i. p. 149 (in nota).—K. arborea, *F. Villar, l. c.* p. 132, t. 428, *non Blume.* F. Villar refers this to *K. arborea*, Blume, which, however, is quite distinct, and must be excluded.

BIGNONIACEÆ.

STEREOSPERMUM QUADRIPINNATUM, *F. Villar, l. c.* p. 151, t. 252. —Millingtonia quadripinnata, *Blanco, l. c.* ed. 1, p. 501; ed. 2, p. 351; ed. 3, vol. ii. p. 286, t. 252. Prov. Albay, Luzon, *Cuming* n. 1003!; Santa Cruz, Prov. Zambales, Luzon, *S. Vidal* n. 479! This is evidently the plant which Blanco had in view, and the only one to which his term "Flores paniculato-racemosi" will apply. It is not the plant figured by Vidal (Syn. t. 73. fig. A), nor yet *Radermachera quadripinnata*, Seem. (Journ. of

Bot. 1870, p. 147), if Cuming n. 996, from Prov. Albay, Luzon, in the Kew Herbarium is the same as in the British Museum.

S. PINNATUM, *F. Villar, l. c.* p. 151.—Millingtonia pinnata, *Blanco, l. c.* ed. 1, p. 501; ed. 2, p. 351; ed. 3, vol. ii. p. 285.—Radermachera pinnata, *Seem. Journ. of Bot.* 1870, p. 147, partim, *excl. syn. Bur.* Of the four species in the Kew Hebarium the only one with pinnate leaves is Cuming n. 1517, from Prov. Batangas, Luzon; and as it agrees in other respects with Blanco's description, I think it may be taken as belonging to this species. Cuming n. 1182, quoted by Seemann, belongs to the next species.

S. BANAIBANAI, *Rolfe.*—Radermachera Banaibanai, *Bureau in Adansonia*, ii. p. 194. Prov. Albay, Luzon, *Cuming* n. 1182! Bureau's plant is based on Callery n. 50, which I have not seen. Seeman confounds it with the previous species, which is clearly an error, as Bureau says, "foliis 2-pinnatis." "Ramuli subvelutini" is also very characteristic of this plant; and as it otherwise agrees with the description, I think both Cuming's and Callery's specimens must represent the same species. I suspect that the vernacular name Banaibanai is applied to more than one species.

S. SEEMANNII, sp. nov.—Rami striati puberuli, foliis 2-pinnatis, foliolis elliptico-oblongis longe acuminatis integris basi attenuatis glabris, paniculis terminalibus amplis v. nonnunquam abbreviatis, calyce campanulato 3-dentato, lobis brevibus late rotundatis, corolla basi angusta supra inflata, lobis late rotundatis; fructu longissimo angustissimo subterete.—Radermachera quadripinna, *Seem. Journ. of Bot.* 1870, p. 147, *non* Millingtonia quadripinnata, *Blanco.*

Luzon, Prov. Albay, *Cuming* n. 996!

Leaflets 3–5 by 1¼–1¾ in.; petiolules ½–1 in. Panicles up to a foot at least long, much branched and many-flowered; but sometimes as short as 3 inches, when they are more dense and with much fewer flowers. Calyx 4 lines. Corolla 1 inch long, the interior much damaged by insects. Fruit immature, nearly 1 ft. long; calyx persistent. The specimens are much broken up. Seemann's plant is Cuming n. 996, which he refers to *Millingtonia quadripinnata*, Blanco; it, however, does not agree with the one figured by Naves, and which agrees with Blanco's description. The plant figured by Vidal as "*Stereospermum quadri-*

pinnatum, F. Villar, *Millingtonia quadripinnata*, Blanco" (Synopsis, t. 73. fig. A), is a puzzle to me; it does not represent the coloured plate quoted by Villar, which I believe is the true plant of Blanco; and none of the Philippine specimens which I have seen have the calyx as represented by Vidal. The only specimen received from him (n. 479) agrees with the coloured plate of Naves, t. 252. A good series of specimens of this genus is much wanted.

VERBENACEÆ.

GEUNSIA CUMINGIANA, *Rolfe.*—Callicarpa Cumingiana, *Schauer, in DC. Prodr.* xi. p. 644; *F. Villar, l. c.* p. 158. The five-parted calyx and corolla and five stamens necessitate the species being transferred to *Geunsia.*

CALLICARPA BLANCOI, *Rolfe.*—C. americana, *Blanco, l. c.* ed. 1, p. 517; ed. 2, p. 360; ed. 3, vol. ii. p. 300, t. 427 *bis, non L.*—C. bicolor, *F. Villar, l. c.* vol. iv. *Nov. App.* p. 158, *non Juss.* The plate and Blanco's synonym are referred to *C. bicolor*, A. Juss., which, however, must be excluded.

LABIATÆ.

SCUTELLARIA LUZONICA, sp. nov.; caule basi procumbente, ramis ascendentibus puberulis, foliis parvis petiolatis ovatis obtusis subrepando-crenatis, utrinque parce pubescentibus, racemis secundis laxis bracteis minutis, calycibus floriferis puberulis, pedicello brevioribus, corollis gracilibus puberulis.

Luzon, without precise locality, *Lobb*!

Rami pedales v. ultra, tetragoni, pilis brevissimis. Folia 3–7 lin. longa. Squama calycis fructiferi valde aucta, membranacea. Corolla puberula, 5 lin. longa, tubo basi angustato, fauce dilatata. Nuculæ valde tuberculosæ.

This species belongs to the section *Stachymacris*, and may stand next before *S. indica*, L., from which it differs in its smaller, more entire leaves, more lax racemes, and its smaller and more slender flowers. It is also a more straggling plant, with totally different pubescence.

EUPHORBIACEÆ.

CLEISTANTHUS BLANCOI, *Rolfe.*—C. ferrugineus, *F. Villar, l. c.* p. 187, t. 353, *non Muell. Arg.* This species is distinct from *C. ferrugineus*, Muell. Arg., which must be excluded.

MYRICACEÆ.

MYRICA VIDALIANA, sp. nov.—Rami glabri, foliis cuneatis v. oblanceolatis subobtusis serratis, basi attenuatis coriaceis, venis subtus reticulatis, petiolis brevibus; amentis masc. compositis brevibus, staminibus 2 (an semper?) filamentis coalitis, bracteis minutis; amentis fœm. longioribus, ovario ovoideo, stylo brevi, stigmatibus patentibus paullo dilatatis; fructu ignoto.

Luzon, Volcano Mayon, Prov. Albay; *S. Vidal* n. 926!

Leaves 1–2¼ in. by 3–8 lin.; male catkins ½ in., female 1–1½ in.

A most distinct species belonging to the section *Faba*. A supposed second species, *M. luzonica*, S. Vidal, is not a *Myrica* at all, but the male of some Euphorbiaceous plant, possibly *Sapium*.

SCITAMINEÆ.

ALPINIA PARVIFLORA, *Rolfe*.—Amomum parviflorum, *Presl, Reliq. Hænk*. ii. p. 112, t. xix. figs. 1–13; *F. Villar, l. c.* p. 224. This species must be referred to *Alpinia*.

A. GRACILIS, *Rolfe*.—Renealmia gracilis, *Blanco, l. c.* ed. 1, p. 1.—R. exaltata, *Blanco, l. c.* ed. 2, p. 1; ed. 3, vol. i. p. 2, *non L.*—Kolowratia elegans, *Presl, Reliq. Hænk.* i. p. 113, t. xx. figs. 1–10.—A. gigantea, *F. Villar, l. c.* p. 225, *excl. syn. plur., non Blume.* F. Villar refers these synonyms to *Alpinia gigantea*, Blume, which is quite distinct, and must be excluded. Blanco, in his first edition, made a new species of it, but in the following one wrongly referred it to an American plant.

DESCRIPTION OF PLATE X.

Fig. 1. *Villaria philippinensis*, Rolfe. Branch, natural size.
2. Bud, showing contorted æstivation, ×2 diam.
3 Expanded flower, showing the villose corolla-throat, ×2 diam.
4. Corolla laid open, showing the linear anthers, ×2 diam.
5. Anther, showing the extremely short filament, ×2 diam.
6. Section of calyx and ovary, showing the villose fusiform style, ×2 diam.
7. Longitudinal section of ovary, showing the ovules, × 4 diam.
8. Transverse section of ovary, showing the parietal placentation, ×4 diam.

Further Contributions to the Flora of Central Madagascar.

By J. G. Baker, F.R.S., F.L.S.

[Read 19th June, 1884.]

Part I. POLYPETALÆ.

Thalamifloræ.

In December we received at Kew a box, which, owing to the unsettled state of political affairs, had taken nearly a year in transit, containing the botanical results of the explorations during 1882 of our energetic correspondent, the Rev. Richard Baron, F.L.S., in Central Madagascar. In the present paper I have described the principal polypetalous Dicotyledons which it contains which appear to be new, and of which the material is complete enough; and I hope next Session to deal with the remaining part of the collection.

Clematis laxiflora, n. sp.

Volubilis, obscure pubescens, foliis longe petiolatis deltoideis pinnatim trifoliolatis, foliolis ovatis acutis obscure cuspidato-dentatis membranaceis utrinque viridibus glabris, floribus laxe paniculatis pedicellis elongatis, alabastris globosis, sepalis oblongis sordide purpurascentibus tomentosis, filamentis deorsum pilosis, stylis dense albo-plumosis.

A woody climber, with slender terete obscurely pubescent branches. Fully-developed leaves deltoid, trifoliolate, with a petiole 2–2½ in. long; leaflets ovate, membranous, glabrous, 2–2½ in. long, with a few shallow teeth with minute cusps; petiolules often bent, the end one nearly an inch long. Panicles deltoid, peduncled, as long as the fully-developed leaves; pedicels slender, the end one 1–1½ in. long. Sepals oblong, dull lilac, ⅓ in. long. Anthers oblong, ½ line long, a quarter the length of the filament. Styles densely plumose.—*Baron* 2448! Leaves like those of *C. mauritiana*, but flowers much smaller and more numerous. Of the suberect section I am afraid that *C. trifida*, Hook. Ic. t. 72, and *C. oligophylla*, Hook. Ic. t. 80, are mere forms of *C. Bojeri*, Hook. Ic. t. 10.

Clematis microcuspis, n. sp.

Volubilis, ramulis pubescentibus, foliis longe petiolatis deltoideis pinnatim 5-foliolatis, foliolis cordato-ovatis facie subglabris dorso dense

pubescentibus, dentibus latis minute cuspidatis, floribus copiose paniculatis, alabastris globosis, sepalis oblongis griseis tomentosis, staminibus pistillisque calyce vix brevioribus.

A woody climber, with densely pubescent, strongly-ribbed stems. Fully-developed leaves pinnately 5-foliolate, with a blade 4–5 inches long and broad, and a common petiole half as long; leaflets cordate-ovate, 2–3 in. long, inciso-crenate, with a minute cusp to each tooth, moderately firm in texture, green and glabrous above, persistently grey-pubescent all over below. Axillary panicles as long as the leaves; pedicels $\frac{1}{2}$–$\frac{3}{4}$ in. long. Fully-developed sepals $\frac{1}{3}$ in. long, dull purple, pubescent. Stamens $\frac{1}{2}$ lin. long., one fourth the length of the filaments. Fruit not seen.—*Baron* 2333! 2336!

CLEMATIS EDENTATA, n. sp.

Volubilis, ramulis parce pubescentibus, foliis longe petiolatis deltoideis pinnatim 5-foliolatis, foliolis ovatis acutis integris firmulis glabris, floribus parvulis laxe paniculatis, alabastris oblongis, sepalis lanceolatis purpurascentibus extus tomentosis, pistillis calyce æquilongis, stylo dense plumoso.

A climber, with slender terete woody branches, thinly pubescent towards the top. Fully-developed leaves pinnately 5-foliolate, with a blade 4–5 in. long and broad, and a petiole half as long; leaflets ovate, entire, acute, firm in texture, glabrous, green on both sides, 2–2$\frac{1}{2}$ in. long. Flowers in sparse leafy panicles at the end of the branches and from the axils of the developed leaves; pedicels pilose, $\frac{1}{2}$–$\frac{3}{4}$ in. long. Bud oblong. Sepals lanceolate, $\frac{3}{8}$–$\frac{1}{2}$ in. long, grey-purple, densely pubescent, acute, not more than $\frac{1}{12}$ in. broad. Stamens and fruit not seen. Styles densely pilose, reaching nearly to the top of the sepals before they fall. —*Baron* 2297! Like the two other species now described, this is allied to *C. simensis*, Fres., and *C. grata*, Wall.

POLYALTHIA LUCENS, n. sp.

Arborea, glabra, foliis breviter petiolatis oblongis obtusis rigide coriaceis facie lucentibus basi deltoideis, floribus axillaribus solitariis cernuis atropurpureis, pedicello flore æquilongo, petalis lanceolatis calyce duplo longioribus, carpellis fructiferis 10–12 monospermis oblongis longe pedicellatis.

A tree, glabrous in all its parts, with slender subterete woody branchlets. Leaves alternate; petiole $\frac{1}{6}$ in. long; blade thick, rigidly coriaceous, 2–3 in. long, 1–1$\frac{1}{4}$ in. broad, obtuse, deltoid at the base, finely veined. Flowers solitary in the axils of the leaves, on very cernuous black pedicels $\frac{1}{4}$ in. long. Calyx $\frac{1}{8}$ in. long; sepals deltoid. Petals 6, lanceolate, $\frac{1}{3}$ in. long, narrowed from base to apex. Fruit-torus woody, hemispheric, alveolate, $\frac{1}{4}$ in. in diam.; carpels oblong, blackish, coriaceous, indehiscent, 1-seeded, $\frac{1}{3}$ in. long, $\frac{1}{4}$ in. in diam., narrowed into a cylindrical pedicel of the same length.—*Baron* 3116! Allied to *P. Chapellieri*, Baillon, Adans. viii. p. 349. In his latest paper Dr. Baillon reduces *Popowia*, *Clathrospermum*, and *Polyalthia*, all three to *Unona*.

THYLACHIUM LABURNOIDES, n. sp.

Fruticosum, glabrum, foliis longe petiolatis pinnatim trifoliolatis, foliolis oblongis, floribus paucis dense corymbosis breviter pedunculatis, alabastro globoso, calyce viridi herbaceo, filamentis toroque subpollicaribus.

A small erect tree, glabrous in all its parts, with crowded branchlets. Leaves alternate; petiole slender, 1–$1\frac{1}{2}$ in. long; leaflets 1–$1\frac{1}{2}$ in. long, all three shortly stalked, obtuse or deltoid at the tip, minutely cuspidate, moderately firm in texture, green and glabrous on both surfaces, obscurely veined. Flowers 6–8 in a dense corymb at the end of the branchlets; pedicels $\frac{1}{4}$–$\frac{1}{3}$ in. long. Bud globose, green, glabrous, $\frac{1}{4}$ in. in diam. Calyx green, herbaceous, the top splitting off from near the base. Stamens 40 or more, about an inch long; anthers small, oblong. Torus rather shorter than the stamens; ovary small, oblong.—*Baron* 3263!

THYLACHIUM LAURIFOLIUM, n. sp.

Arboreum, glabrum, foliis simplicibus oblongis obtusis rigide coriaceis longe petiolatis, floribus paucis corymbosis longe petiolatis, alabastro globoso, calyce brunneo coriaceo, filamentis 2–$2\frac{1}{4}$ poll. longis, toro tripollicari.

A tree, glabrous in all its parts, with slender woody subterete branchlets. Leaves rather crowded, alternate, ascending; petiole about an inch long, articulated at the tip; blade rigidly coriaceous, dark green on both surfaces, obscurely veined, quite entire, deltoid at the base, 2–3 in. long, 1–$1\frac{1}{4}$ in. broad. Flowers 4–6 in a corymb at the end of the branchlets; pedicels $1\frac{1}{2}$–2 in. long, without bracts or bracteoles. Bud globose, glabrous, coriaceous, $\frac{1}{2}$ in. in diam., the calyx splitting off in a cap below the middle. Stamens about 30, with long glabrous filaments and small oblong anthers. Ovary small, ovoid, with a filiform torus 3 in. long.—*Baron* 2862!

ONCOBA CAPREÆFOLIA, n. sp.

Arborea, inermis, ramulis pubescentibus, foliis magnis petiolatis late oblongis obtusis facie obscure dorso conspicue pubescentibus venulis exsculptis, floribus solitariis lateralibus breviter pedunculatis, sepalis deltoideis persistentibus, fructu globoso duro multisulcato griseo-velutino, placentis circiter 20, seminibus multis nigris turgidis oblongo-reniformibus.

A tree, with pubescent branchlets. Leaves alternate; petiole about ½ in. long; blade broad oblong, entire, 3–4 in. long, 1½–2 in. broad, moderately firm in texture, green and obscurely pilose above, conspicuously grey-pubescent beneath, with all the veins and veinlets raised. Flowers solitary, axillary, with very short pedicels. Fruit-calyx ½ in. in diameter. Sepals deltoid, pubescent. Corolla and stamens not seen. Fruit woody, globose, indehiscent, 1–1¼ in. in diam., with about 20 placentas and the same number of ribs outside, persistently grey-pubescent, tipped with a cusp surmounted by a capitate black stigma. Seeds black, oblong-reniform, ¼ in. long, with a crustaceous testa.—*Baron* 2355! Allied to *O. tettensis* and *Petersiana*.

PITTOSPORUM STENOPETALUM, n. sp.

Glabrum, foliis petiolatis obovato-cuneatis obtusis rigide coriaceis lucentibus, floribus in cymos umbellatos paucifloros pedunculatos verticillatos vel paniculatos dispositis, sepalis minutis deltoideis, petalis parvis oblanceolatis sordide luteo-viridibus, staminibus flore vix brevioribus, fructu bivalvi biloculari magnitudine pisi, seminibus in loculo solitariis.

A tree, glabrous in all its parts, with slender terete woody branchlets. Leaves alternate, narrowed into a petiole ¼ in. long, 2–3 in. long, 1–1½ in. broad above the middle, obtuse, narrowed gradually from the middle to the base, firm in texture, green on both surfaces, shining, with fine distinctly visible erecto-patent branching veins. Cymes umbellate, few-flowered, peduncled, simply verticillate at the end of the branchlets, or forming a sparse panicle; pedicels finally ⅙–¼ in. Petals ⅛ in. long, deciduous. Stamens with a versatile oblong anther, one third the length of the glabrous filament. Ovary ovoid, 2-celled, narrowed into an entire style ½ in. long. Capsule brown, rigidly coriaceous, globose, ¼ in. in diam., split down to the base into 2 valves; dissepiment complete. Seeds solitary in the cells.—*Baron*, 417! 2218!; *Hildebrandt* 3670!

POLYGALA PILOSA, n. sp.

Perennis, pilosa, caulibus gracilibus prostratis ramosis, foliis alternis sessilibus lineari-oblongis obtusis uninerviis, floribus in racemos terminales densos dispositis, pedicellis brevissimis, bracteis minutis caducis, sepalis exterioribus ovatis herbaceis, interioribus petaloideis albis viridi venosis obovato-unguiculatis petalis æquilongis, carina curvata appendiculata.

A perennial herb, with densely pilose, trailing, slender, branched stems 4–6 in. long. Leaves alternate, sessile, linear-oblong, flat, pilose, green on both surfaces, $\frac{1}{4}$–$\frac{1}{3}$ in. long. Flowers greenish, $\frac{1}{12}$ in. long, many in a peduncled terminal capitate raceme; pedicels very short; bracts very minute, deltoid. Calyx $\frac{1}{12}$ in. long; outer sepals ovate, green, erecto-patent; inner suborbiculate, white, with about 5 flabellate green veins anastomosing in arches near the margin. Keel $\frac{1}{12}$ in. long, curved, appendiculate. Capsule not seen.—*Baron* 939! Allied to our European *P. amara*, L.

SPHÆROSEPALUM, genus novum Guttiferarum.

Sepala 4 orbicularia rigide coriacea valde imbricata. Petala 4 ab sepalis vix dissimilia tenuiora magis oblonga. Stamina perplurima uniseriata hypogyna, infra discum inserta, filamentis filiformibus, antheris parvis subglobosis versatilibus. Discus tenuis annularis. Ovarium latum planum biloculare leviter bilobum, ovulis in loculo circiter 3 axillaribus; stylus filiformis; stigma capitatum. Fructus ignotus.—Frutex Madagascariensis inermis, glaber, foliis stipulatis petiolatis alternis magnis oblongis obtusis rigide coriaceis crebre venulosis, floribus in cymas umbellatas copiose paniculatas dispositis.

Differs from normal Guttiferæ by its alternate stipulate leaves. It may perhaps have an affinity with *Caraipa* and its neighbours in Ternstrœmiaceæ, but as yet the fruit and seeds are unknown.

SPHÆROSEPALUM ALTERNIFOLIUM.

An erect shrub or tree, glabrous in all its parts, with slender terete woody branchlets. Leaves alternate; stipules deciduous; petiole $\frac{1}{2}$–$\frac{3}{4}$ in. long; blade oblong obtuse, entire, rounded at the base, rigidly coriaceous, green on both sides, rather glossy above, 4–5 in. long, 2–3 in. broad at the middle, all the veins and veinlets raised, the main ones ascending. Flowers in copious cymes forming an ample lax deltoid panicle at the end of the branches mixed with the top leaves; pedicels $\frac{1}{3}$–$\frac{1}{2}$ in. long, thickened upwards. Flowers seen only in an early stage. Sepals 4, orbicular, much imbricated, blackish, glabrous, decussate, $\frac{1}{6}$ in. long. Petals scarcely different from the sepals, more oblong, thinner in texture. Stamens very numerous, inserted beneath the disk in a single row; filaments filiform, $\frac{1}{8}$ in. long; anthers small, orbicular, versatile. Ovary flat on the top, 2-celled; ovules about 3 in a cell, axile. Style slender, cylindrical, $\frac{1}{12}$ in. long. Stigma black, capitate.—*Baron* 2412!

SYMPHONIA (CHRYSOPIA) ACUMINATA, n. sp.

Glabra, ramulis gracilibus, foliis petiolatis obovato-oblongis acuminatis, venulis crebris erecto-patentibus, umbellis terminalibus 4–8-floris, pedicellis flore triplo longioribus, calycis parvi rubelli segmentis ovatis, petalis latis rubellis calycem triplo superantibus, disco patellæformi, filamentis monadelphis, antheris 15 lanceolatis tubo 2–3plo brevioribus, lobis stigmatosis stellatim patulis.

A tree, with slender subterete woody branchlets, glabrous in all its parts. Leaves opposite, shortly petioled, moderately firm in texture, green on both surfaces, 2–3 in. long, $\frac{3}{4}$–1 in. broad above the middle, remarkably acuminate, deltoid at the base, with close fine erecto-patent veins clearly visible on the lower surface. Flowers 4–8 in an umbel from the axils of the leaves at the end of the branchlets; pedicels $\frac{1}{2}$–$\frac{3}{4}$ in. long. Calyx $\frac{1}{6}$ in. in diameter, bright red; sepals ovate, much imbricated, $\frac{1}{8}$ in. long. Petals bright red, $\frac{1}{3}$ in. long. Anthers 15, lanceolate, $\frac{1}{2}$ lin. long; filaments all united in an ampullæform tube; disk patellæform; stigmatic lobes 5, cylindrical, stellate, $\frac{1}{2}$ line long.—*Baron* 2890! 2921! Closely allied to *S. pauciflora* and *eugenioides*.

RHODOLÆNA ACUTIFOLIA, n. sp.

Arborea, glabra, foliis breviter petiolatis oblongis rigide coriaceis acutis, floribus 1–2nis terminalibus, bracteis caducis, pedicellis brevibus incrassatis, bracteolis 2 minutis ovatis adpressis persistentibus, sepalis magnis coriaceis oblongis obtusis glabris, petalis obovatis purpureis calyce sesquilongioribus, genitalibus petalis paulo brevioribus.

An erect tree, glabrous in all its parts, with slender, terete, woody branchlets. Stipules deciduous before the flowers appear; petiole short, rugose; blade 2–3 in. long, 1–$1\frac{1}{2}$ in. broad at the middle, thick, rigidly coriaceous, lucent, with fine erecto-patent veinlets. Flowers 1–2 at the end of short branchlets; bracts deciduous before the flower expands; pedicels thick, under ½ in. long. Calyx glabrous, firm in texture, brown, an inch long, with a pair of small ovate bracteoles at its base; sepals very obtuse, imbricated, ⅝–¾ in. broad. Petals 1½ in. long, 1 in. broad, bright dark lilac. Stamens numerous; anthers small, subglobose; filaments an inch long. Stigma just overtopping the anthers.—*Baron* 2427!

Psorospermum trichophyllum, n. sp.

P. ramulis ferrugineo-pubescentibus, foliis petiolatis oblongis integris facie glabris dorso pubescentibus, cymis multifloris terminalibus brevissime pedunculatis, pedicellis brevibus, sepalis ovatis dense pilosis, petalis oblongis calyce sesquilongioribus, staminibus circiter 15 pentadelphis.

A shrub, with very slender ferrugineo-pubescent branchlets. Leaves distinctly petioled, 1½–2 in. long, moderately firm in texture, green and glabrous above, ferruginous on the midrib beneath, the rest covered with persistent grey pubescence. Cymes 10–12-flowered, terminal, shortly peduncled; pedicels ⅛–⅙ in., densely pubescent. Calyx 1/12 in., densely pubescent. Petals brownish. Stamens in 5 bundles of 3 each, as long as the calyx. Styles very short in the flowering stage. Fruit not seen.—*Baron* 3016!

Psorospermum discolor, n. sp.

P. ramulis castaneis apice ferrugineo-pubescentibus, foliis oblongis acutis integris membranaceis glabris dorso albidis, cymis terminalibus paucifloris brevissime pedunculatis, pedicellis ferrugineo-pubescentibus flore æquilongis, sepalis ovatis, petalis oblongis calyce longioribus, staminibus circiter 15 pentadelphis, stylis brevibus.

A shrub, with castaneous very slender branchlets, glabrous, except at the tip. Petiole ¼–½ in.; blade oblong, acute, deltoid at the base, thin in texture, 2–3 in. long, bright green above, whitish beneath. Cymes terminal, corymbose, 6–10-flowered. Calyx 1/12 in. long, ferrugineo-pubescent, like the pedicels and peduncle. Petals ⅙ in. long, oblong. Phalanges of stamens pilose, as long as the calyx. Ovary ovoid, with 5 short styles, with capitate stigmas. Fruit not seen.—*Baron* 2222! 2825! Nearly allied to *P. leptophyllum.*

Psorospermum leptophyllum, n. sp.

P. ramulis glabris apice ferrugineo-pubescentibus, foliis oblongis acutis integris membranaceis glabris dorso albidis, cymis multifloris corymbosis terminalibus pedunculatis, pedicellis ferrugineo-pubescentibus flore æquilongis, sepalis ovato-oblongis, petalis calyce duplo longioribus, staminibus pentadelphis, stylis brevibus, stigmatibus penicillatis.

A shrub, with very slender reddish-brown branchlets, glabrous and shining except at the very tip. Petiole $\frac{1}{4}$–$\frac{1}{2}$ in. long; blade 3–4 in. long, $1\frac{1}{4}$–$1\frac{1}{2}$ in. broad at the middle, acuminate, deltoid at the base, thin in texture, entire, green on the upper surface, whitish beneath, the veins fine and inconspicuous. Cymes of 30–40 flowers on a peduncle about an inch long. Calyx $\frac{1}{8}$ in. long, thinly clothed, like the peduncle and pedicels, with ferruginous pubescence. Petals nearly $\frac{1}{4}$ in. long. Phalanges of stamens pilose, as long as the calyx, 3 in each bundle. Styles short; stigmas capitate, penicillate. Fruit not seen.—*Baron* 2857!

PSOROSPERMUM CERASIFOLIUM, n. sp.

Glabrum, foliis petiolatis oblongis obtusis subintegris firmulis utrinque viridibus, cymis 6–12-floris terminalibus pedunculatis, pedicellis flore 3–4plo longioribus, sepalis oblongis, petalis oblongis acutis calyce sesquilongioribus, staminibus 20–25 pentadelphis, stylis elongatis falcatis.

A shrub, with woody brown glabrous branchlets, flattened and thickened below the nodes. Petiole $\frac{1}{4}$ in. long; blade 2–3 in. long, 1–$1\frac{1}{4}$ in. broad at the middle, rather rounded at the base, obscurely crenulate, moderately firm in texture, green and glossy above, paler and duller beneath, with 6–8-jugate distinct main veins. Peduncle flattened, 1–2 in. long; pedicels $\frac{1}{2}$–$\frac{3}{4}$ in., erect, glandulose. Calyx $\frac{1}{6}$ in. long; sepals glabrous, subobtuse, much dotted with black. Petals $\frac{1}{4}$ in. long. Stamens sometimes 5 in a bundle. Immature fruit black, globose, the size of a pea, tipped with 5 curved styles $\frac{1}{8}$ in. long; stigma capitate.—*Baron* 3033! 3034!

HIBISCUS PALMATIFIDUS, n. sp.

Fruticosus, ramulis ferrugineo-pubescentibus, foliis longe petiolatis orbicularibus subcoriaceis 5-nervatis facie calvatis dorso pubescentibus apice leviter trilobatis, floribus solitariis breviter pedunculatis, bracteolis 5 deltoideis basi connatis, calycis segmentis deltoideis, petalis magnis latis dorso pubescentibus, fructu duro globoso piloso.

A shrub, with terete woody branchlets, densely coated with stellate brown pubescence. Petiole $1\frac{1}{2}$–3 in. long; blade cordate-orbicular, 3–6 in. broad, shallowly 3-lobed at the top, moderately rigid in texture, with 5 strong ribs radiating from the base to the margin, obscurely pilose in an early stage above, covered with persistent brown stellate pubescence beneath. Flowers on solitary axillary peduncles about ½ in. long. Epicalyx coriaceous, adpressed to the calyx, ¾ in. long and broad. Calyx as long as the epicalyx. Petals obovate-cuneate, much imbricated, 2 in. long, red-brown inside, coated with drab tomentum externally. Column as long as petals. Capsule 5-celled, globose, an inch in diameter, very hairy inside, splitting up into 5 woody valves.—*Baron* 2548! Connects *Euhibiscus* and *Paritium*.

DOMBEYA MACRANTHA, n. sp.

Fruticosa, dense pannosa, foliis longe petiolatis cordato-ovatis serrulatis, floribus terminalibus parce corymbosis et solitariis axillaribus longe pedunculatis, bracteolis magnis ovatis profunde laceratis, sepalis magnis ovatis pannosis, petalis obovato-cuneatis maximis scariosis persistentibus, staminibus fertilibus circiter 20 antheris lanceolatis, staminodiis longissimis petalis æquilongis, ovario globoso dense piloso.

A shrub a yard high, with dense pubescent woody branchlets. Stipules caducous; petiole 1–2 in. long; blade 3–4 in. long, very thick in texture, and densely coated with brown tomentum on both sides, cordate at the base, obscurely denticulate. Flowers solitary, from the axils of the leaves on pedicels as long as the petiole, and a few at the end of the branch. Bracteoles ovate, persistent, an inch long, deeply lacerated. Sepals 1½ in. long, ovate acuminate. Petals 2 in. long, 1¼ in. broad, brown, glabrous. Anthers ¼ in. long. Staminodes twice as long as the stamens, their free strap-shaped points 1½ in. long. Fruit woody, globose, densely pilose.—*Baron* 710!, also *Hildebrandt* 3895! from the Betsileo country.

DOMBEYA FLORIBUNDA, n. sp.

Arborea, ramulis adpresse lepidotis, foliis magnis petiolatis oblongis integris rigide coriaceis dorso venulosis, venis primariis intra marginem anastomosantibus, cymis decompositis multifloris longe pedunculatis, pedicellis elongatis, sepalis lanceolatis lepidotis, petalis parvis persistentibus cuneatis, staminibus fertilibus 10, staminodiis petalis duplo brevioribus, ovario globoso lepidoto.

A tree, with woody branchlets coated with drab lepidote scales. Petiole ½–1 in. long; stipules caducous; blade oblong, obtuse, entire, 6–8 in. long, 2–2½ in. broad, rigid in texture, glossy on both sides, the main veins anastomosing beneath by intramarginal arches. Cymes very compound, dichotomous, on lateral peduncles 2–3 in. long; pedicels about $\frac{1}{2}$ in. long. Calyx $\frac{1}{6}$ in. long; sepals lanceolate, lepidote like the branchlets. Petals $\frac{1}{4}$ in. long, scariose, brown, persistent. Stamens very small. Staminodes not more than half as long as the corolla. Ovary small, globose, lepidote, narrowed into a long style.—*Baron* 2373! Habit and flowers like those of *Melhania laurifolia*, which only differs from *Dombeya* by its isomerous stamens.

DOMBEYA REPANDA, n. sp.

Arborea, ramulis adpresse lepidotis, foliis magnis petiolatis oblongis repandis subcoriaceis glabris, cymis paucifloris axillaribus pedunculatis, pedicellis flore brevioribus, sepalis lanceolatis lepidotis, petalis parvis persistentibus cuneatis, staminibus fertilibus 10, staminodiis petalis duplo brevioribus, ovario globoso lepidoto.

Calyx, corolla, stamens, and staminodes just as in *D. floribunda*; but cymes sparser and leaves quite different, with 6–8 pairs of erecto-patent main veins produced nearly to the margin, and not anastomosing by distinctly raised cross-arches a little within the margin.—*Baron* 2599!

GREWIA MACROPHYLLA, n. sp.

Arborea, ramulis dense ferrugineo-pubescentibus, foliis magnis petiolatis cordato-ovatis acutis denticulatis subcoriaceis facie calvatis dorso pubescentibus, cymis lateralibus et terminalibus pluribus corymbosis, pedicellis pedunculisque dense ferrugineo-pubescentibus, sepalis lanceolatis dense ferrugineo-tomentosis, petalis dense pilosis, ovario globoso dense piloso.

A tree, with slender terete woody branches, densely clothed with ferruginous tomentum. Petiole $\frac{1}{4}$–$\frac{1}{2}$ in. long; blade sometimes $\frac{1}{2}$ ft. long, 3 in. broad, moderately firm in texture, acute, finely inciso-crenate, green and glabrescent on the upper surface, clothed with ferruginous pubescence beneath; the erecto-patent main veins and intermediate veinlets raised. Cymes lateral, and forming an ample end-corymb; peduncles and pedicels $\frac{1}{2}$–$\frac{3}{4}$ in., densely ferruginoso-tomentose. Calyx above $\frac{1}{2}$ in. long; sepals lanceolate. Petals linear-oblong, densely pilose outside, as long as the calyx. Ovary globose, 4-celled, clothed with soft pale-brown hairs; style $\frac{1}{4}$ in. long; stigma capitate.—*Baron* 2420! 2549! Allied to *G. ferruginea*, Hochst.

GREWIA CUNEIFOLIA, n. sp.

G. ramulis gracilibus lepidotis, foliis subsessilibus obovato-cuneatis obtusis inciso-crenatis subcoriaceis glabris trinervatis, cymis axillaribus

pedunculatis 2–3-floris, pedicellis flore longioribus, sepalis lanceolatis dorso lepidotis, petalis lanceolatis calyce æquilongis, fructu tricocco rugoso.

A tree, with slender branchlets clothed with adpressed lepidote pubescence. Leaves rigid in texture, 2–3 in. long by about an inch broad, narrowed gradually from the middle to the base, with 3 strong main veins continued from the base to the very obtuse apex, minutely toothed throughout, green and glabrous on both surfaces. Cymes axillary; peduncles and pedicels about $\frac{1}{2}$ in. long. Calyx $\frac{1}{4}$ in. long; sepals lanceolate, lepidote on the back. Petals lanceolate, about as long as the calyx. Stamens equalling the calyx. Fruit of three small hard rugose one-seeded glabrous lobes.—*Baron* 2251! 3223! Allied to *G. trinervata*, Baker in Trimen's Journ 1882, p. 47.

ERYTHROXYLUM FIRMUM, n. sp.

Glabrum, petiolis brevissimis, foliis oblanceolato-oblongis rigide coriaceis venulis faciei inferioris pulchre anastomosantibus, floribus 1-3nis axillaribus et supra folios productis, pedicellis flore longioribus, bracteis sepalisque ovatis, petalis oblongis calycem duplo superantibus.

A shrub, glabrous in all its parts, with rather flattened grey branchlets. Leaves $1\frac{1}{2}$–2 in. long, obtuse, narrowed to the base, very rigid in texture, green on both surfaces, the fine erecto-patent main veins beneath connected by distinct cross-arches just within the edge. Flowers in copious clusters both in the axils of the leaves and on the short leafless ramuli; bracts ovate, shorter than the stiffly erect pedicels, which are $\frac{1}{12}$–$\frac{1}{8}$ in. long. Calyx campanulate, 1 lin. in diam.; sepals deltoid, connate at the base. Petals twice as long as the sepals, with an obovate scale across the claw, with an incurved free apex. Stamens shorter than the petals; anthers oblong, equalling the filaments. Ovary depresso-globose, with 3 short styles, with capitate stigmas.—*Baron* 2740! 2848! Near the Mauritian *E. laurifolium*, Lam.

RHODOCLADA, genus novum Linacearum?

Calyx campanulatus, segmentis 5 oblongis obtusis imbricatis coriaceis persistentibus reflexis. Petala 5 oblonga decidua calyce paulo longiora. Stamina 10 leviter perigyna, filamentis filiformibus basi in cupulam brevem connatis, antheris globosis. Ovarium globosum sessile biloculare, ovulis pluribus in loculo ab apice pendulis; stylus filiformis, stigmate capitato. Fructus ignotus.—Arbor Madagascariensis, foliis alternis exstipulatis obovatis rigide coriaceis integris subsessilibus articulatis, floribus parvis

copiose paniculatis, paniculæ ramis ferrugineo-pubescentibus, pedicellis brevibus basi articulatis, genitalibus breviter exsertis.

This very distinct-looking plant differs from Linaceæ by its slightly perigynous stamens, 2-celled ovary, several ovules in a cell, and simple style. Of known genera it appears to come nearest to *Asteropeia*; but the fruit has not yet been found. The flowers resemble those of an *Erythroxylon*, and leaves those of a simple-leaved species of *Rhopala*.

RHODOCLADA RHOPALOIDES, *Baker*, sp. unica.

An erect tree, with crowded branchlets, clothed with fine bright ferruginous pubescence. Leaves alternate, simple, obovate-cuneate, entire, about 2 in. long, narrowed gradually from the middle to a very short petiole, which readily disarticulates at the base, glabrous on both surfaces; the erecto-patent side-veins fine and immersed. Flowers in deltoid terminal panicles 2–3 in. long, with spreading or erecto-patent branches, clothed with ferruginous pubescence; pedicels very short, articulated at the base, originating from the swollen nodes of the rhachis. Sepals $\frac{1}{12}$ in. long, oblong, persistent, reflexing, imbricated. Petals oblong, $\frac{1}{8}$ in. long. Stamens and style slightly exserted.—*Baron* 3094! 3096!

OXALIS (§ BIOPHYTUM) MACROPODA, n. sp.

O. caule elongato lignoso simplici, foliis dense congestis breviter petiolatis linearibus pinnatis, foliolis confertis 40–50-jugis quadratis basi auriculatis apice oblique cuspidatis, pedunculis folio 2–3plo brevioribus, bracteis multis minutis congestis, pedicellis brevibus glandulosis, sepalis ovato-lanceolatis conspicue nervatis fructu globoso brevioribus, stylis hispidis.

Leaves in a dense cluster at the summit of a simple woody stem 2 ft. long, linear, 3–4 in. long, with a slender pilose rhachis and short petiole. Leaflets $\frac{1}{8}$–$\frac{1}{6}$ in. broad, crowded, sensitive, reflexing, rigid in texture, green on both sides, with an excentric midrib, distinct erecto-patent veinlets, a cusp directed upwards, and a basal auricle close to the rhachis. Peduncle slender, much shorter than the leaves; pedicels $\frac{1}{8}$ in. long, rugose, with prominent black glands. Sepals $\frac{1}{8}$ in. long, with 3 strong ribs. Petals not seen. Capsule globose, $\frac{1}{6}$ in. in diam.; styles hispid, half as long as the capsule.—*Baron* 2307! Near *O. myriophylla*, O. Hoffm. in Rel. Rutenb. iv. 243.

TODDALIA PILOSA, n. sp.

Inermis, ramulis dense pilosis, foliis petiolatis trifoliolatis, foliolis oblanceolato-oblongis integris subcoriaceis dorso pilosis, cymis axillaribus sessilibus 3–5-floris, pedicellis brevissimis, sepalis orbicularibus minutis persistentibus, fructu globoso glabro nigro biloculari haud lobato.

An erect tree, with unarmed slender terete densely pilose branchlets. Petiole $\frac{3}{4}$–1 in.; leaflets 2–3 in. long, under an inch broad, narrowed gradually from the middle to the base, moderately firm in texture, green on both surfaces, distinctly dotted over with black glands beneath. Cymes in the axils of the leaves all down the branchlets. Calyx minute, persistent. Petals not seen. Fruit the size of a pea, black, entire, globose, with copious glandular hollows in the epicarp; all the three layers thin.—*Baron* 3093!

OCHNA VACCINIOIDES, n. sp.

Glabra, foliis oblongis parvis brevissime petiolatis rigidulis crenulatis, cymis lateralibus 2–3-floris, pedicellis flore æquilongis, sepalis persistentibus inæqualibus patulis obovatis vel oblongis, stylo elongato.

A shrub, glabrous in all its parts, with slender terete branchlets. Leaves bright green on both surfaces, moderately firm in texture, $\frac{1}{2}$–$\frac{3}{4}$ in. long, subobtuse, rounded at the base, distinctly crenulate, with fine immersed veins. Flowers 2–3 together in nearly sessile lateral cymes; pedicels $\frac{1}{4}$–$\frac{1}{3}$ in., ascending or cernuous. Fruit-calyx $\frac{5}{8}$ in. in diam., spreading horizontally; outer sepals obovate, inner oblong. Petals and stamens not seen. Style straight, gynobasic, $\frac{1}{4}$ in. long.—*Baron* 3028!

OCHNA SERRATIFOLIA, n. sp.

Glabra, foliis oblongis parvis brevissime petiolatis rigidulis serrulatis dentibus ascendentibus cuspidatis, cymis lateralibus paucifloris, pedicellis flore longioribus, sepalis persistentibus oblongis patulis, stylis apice liberis.

A shrub, glabrous in all its parts, with slender woody terete branchlets. Leaves 1–1$\frac{1}{2}$ in. long, subobtuse, deltoid at the base, moderately rigid in texture, dark green on both surfaces, with fine immersed veins, minutely toothed, with small ascending deltoid teeth tipped with a cusp. Cymes few, lateral, nearly sessile; pedicels $\frac{1}{2}$ in. long, ascending or cernuous. Fruit-calyx spreading, nearly an inch in diameter; sepals oblong, rigid, brown, the inner much narrower than the outer. Petals not seen. Stamens very short. Ovary globose; style with 5 short spreading branches.—*Baron* 811! Allied to *O. Wightiana*, Wall., of India and Ceylon.

GOMPHIA PERSEÆFOLIA, n. sp.

Glabra, ramulis angulatis, foliis petiolatis oblanceolato-oblongis obtusis emarginatis rigide coriaceis, racemis subdensis subpaniculatis, pedunculo ancipiti, pedicellis flore æquilongis, sepalis persistentibus oblongis reflexis, fructu globoso.

A tree, with slender woody branchlets, glabrous in all its parts. Leaves alternate, not crowded, shortly petioled; blade 4–6 in. long, 1–1¾ in. broad above the middle, narrowed gradually to the base, entire, obtuse, and distinctly emarginate at the apex, thick and very rigid in texture, glossy, with fine immersed veinlets. Racemes dense, on axillary or terminal slender ancipitous ascending peduncles 1½–3 in. long; flowers in shortly-peduncled cymes at some of the lower nodes; pedicels ¼ in. long. Fruit-calyx ⅙ in. long, reflexing; sepals brown, oblong. Petals and stamens not seen. Fruit small, globose. Style very slender, ⅙ in. long.—*Baron* 2226! Near *G. obtusifolia*, DC.

GOMPHIA LANCEOLATA, n. sp.

Glabra, ramulis gracilibus teretibus, foliis petiolatis lanceolatis vel oblongo-lanceolatis integris rigide coriaceis, racemis axillaribus vel terminalibus pedunculatis erectis vel cernuis, pedicellis flore longioribus, sepalis oblongis persistentibus diu ascendentibus, fructu globoso.

A tree, with slender terete woody branchlets, glabrous in all its parts. Leaves not crowded, thick and rigid in texture, entire, obtuse with a minute cusp, 2–4 in. long, ¾–1 in. broad at the middle, green and rather glossy on both surfaces, with fine immersed veinlets. Racemes terminal or from the axils of the upper leaves; peduncles slender, erect or cernuous, as long as or shorter than the leaves; pedicels finally ½–¾ in. Fruit-calyx ⅓ in. long, ascending; sepals brown, narrow oblong. Petals and stamens not seen. Style very slender, ⅓ in. long.—*Baron* 2960! 2984! 3076! Allied to *G. obtusifolia*, DC. Mém. t. 8.

GOMPHIA ANCEPS, n. sp.

Glabra, ramulis gracilibus angulatis, foliis magnis subsessilibus oblongolanceolatis subintegris rigide coriaceis, racemis pendulis cylindricis pedunculo elongato ancipiti, pedicellis flore æquilongis, sepalis oblongis persistentibus reflexis, ovario turbinato, stylo elongato.

A tree, with slender angled woody branchlets, glabrous in all its parts. Leaves subsessile, 6–9 in. long, 1½–2 in. broad at the middle, entire or obscurely crenulate, narrowed to the base and a subobtuse point, firm but not very rigid in texture, green and rather glossy on both surfaces, with fine immersed veinlets. Peduncles lateral, slender, pendulous, ancipitous, ½ ft. long. Racemes cylindrical, moderately dense, 4–6 in. long; lower flowers 2–3nate; pedicels articulated, ⅓ in. long. Calyx persistent, ⅓ in. long; sepals oblong, reflexing, brownish in the fruiting-stage. Petals and stamens not seen. Fruit turbinate, containing 2–3 subglobose polished brown-black seeds the size of a pea. Style finally ½ in. long.—*Baron* 2376! Allied to *G. dependens*, DC. Mém. t. 6.

OLAX EMIRNENSIS, n. sp.

Glaber, foliis ovatis acutis integris rigidulis uninerviis, cymis axillaribus sessilibus 6–8-floris, pedicellis brevibus basi bracteatis, calyce campanulato parvo truncato, petalis 5 lanceolatis, antheris fertilibus 3, sterilibus 6 ligulatis, ovario globoso, stylo elongato.

An erect shrub, glabrous in all its parts. Leaves alternate, dull grey-green, moderately firm in texture, 2–3 in. long, obtuse or subacute, the veins fine and entirely hidden except the midrib, the petiole very short and articulated at the base. Cymes sessile, axillary, deltoid; pedicels $\frac{1}{8}$–$\frac{1}{6}$ in., with a minute deltoid persistent bract at the base. Calyx campanulate, $\frac{1}{12}$ in. in diam., quite truncate. Corolla reddish, cylindrical, ⅓ in. long. Stamens 3, perfect, with small oblong anthers; staminodia 6, ligulate, twice as long as the anthers. Ovary ovoid, sessile; style half as long as the petals; stigma capitate.—*Baron* 3078! A near ally of the Mauritian *O. psittacorum*, Vahl (*Fissilia*, Lam.).

PYRENACANTHA CHLORANTHA, n. sp.

Volubilis, ramulis obscure pilosis, foliis breviter petiolatis obovato-oblongis rigidulis glabris subintegris, floribus fœmineis racemosis, pedicellis brevissimis, bracteis linearibus, perianthii segmentis 4 obovatis pilosis, fructu oblongo compresso acuto.

A shrub, with climbing slender terete pubescent branchlets. Leaves shortly petioled, bright green, moderately firm in texture, obtusely cuspidate, narrowed to a slightly rounded base, 2–3 in. long, ¾–1 in. broad above the middle, entire or obscurely toothed. Racemes axillary, shortly peduncled, shorter than the leaves; rhachis, short pedicels, and linear bracts pilose. Bud globose, green, ½ lin. in diam.; sepals 4, almost orbicular, green, free to the base. Fruit oblong, black, compressed, glabrous, indehiscent, coriaceous, above ½ in. long, narrowed to an acute apex; epicarp thin, brown; mesocarp thin; endocarp thin, white, densely spiny inside the cavity, filled with one large seed.—*Baron* 1374! (fruit), 3018! (female flower). *Baron* 1348, with oblong-acute glabrous strongly toothed leaves, is very likely another new species of this genus; but the flowers are too immature to be certain.

DESMOSTACHYS ACUMINATA, n. sp.

D. ramulis gracilibus pilosis, foliis breviter petiolatis oblongis acuminatis rigidulis dorso hispidulis, floribus in spicas axillares fastigiatas dispositis, calycis minuti pilosi segmentis deltoideis, petalis lanceolatis dense pilosis, staminibus inclusis, ovario ovoideo piloso.

An erect shrub, with slender terete woody pilose branchlets. Leaves 3–4 in. long, 1–1¼ in. broad, rounded at the base, pale green, moderately firm in texture, the raised main veins of the under surface united by distinct simple cross-arches. Spikes axillary, clustered, 1–1½ in. long, with a very hairy slender rhachis. Calyx ½ lin. in diam.; sepals deltoid. Petals yellowish, densely pilose, $\frac{1}{12}$ in. long. Stamens with a linear-oblong anther equalling the filament. Ovary ovoid, very hairy, narrowed into a cylindrical style as long as itself.—*Baron* 2622!

DESMOSTACHYS DELTOIDEA, n. sp.

D. ramulis gracilibus pilosis, foliis breviter petiolatis oblongis acutis rigidulis glabris, floribus in racemos paniculatos dispositis, calycis minuti pilosi segmentis deltoideis, petalis oblanceolatis viridibus dense pilosis, staminibus inclusis, fructu globoso.

An erect shrub, with very slender terete pilose branchlets. Leaves shortly petioled, pale green, moderately firm in texture, glabrous, 1½–2 in. long, ¾–1 in. broad, subdeltoid at the base, narrowed gradually to an acute apex, the veins fine and inconspicuous. Racemes under an inch long, forming a deltoid panicle at the end and side of the branches; axis pilose; pedicels very short; bracts minute, deltoid. Calyx campanulate, green, ½ lin. in diam. Petals very hairy, greenish, $\frac{1}{12}$ in. long. Disk with 5 lobes. Immature fruit globose, rather hairy, the size of a pea, tipped with the short cylindrical style.—*Baron* 2926! *D. Renschii*, O. Hoffm. & Hildeb. Sertum, p. 11, is the same species as *D. Planchonianus*, Miers, Contrib. i. p. 68, tab. 9.

Elæodendron nitidulum, n. sp.

E. ramulis pubescentibus, foliis alternis breviter petiolatis obovatis vel oblongis parvis rigidis nitidulis viridibus integris glabris, cymis ad ramos supra folios dispositis, floribus parvis pentameris, pedicellis brevibus, calycis segmentis deltoideis, petalis orbicularibus, staminibus inclusis.

A much-branched erect shrub, with slender pubescent terete branchlets. Leaves about an inch long, obtuse, truncate or emarginate, firm in texture, deltoid at the base, bright green, the veins fine and immersed. Cymes crowded on the branchlets above the leaves; pedicels $\frac{1}{12}$ in. Calyx campanulate, $\frac{1}{2}$ lin. diam.; segments deltoid. Expanded corolla $\frac{1}{12}$ in. diam. Stamens half as long as the petals. Fruit unknown.—*Baron* 3084!

Elæodendron vaccinioides, n. sp.

E. ramulis pubescentibus, foliis parvis alternis breviter petiolatis oblongis crenatis rigidis lucidulis glabris, cymis paucifloris axillaribus, floribus minutis pentameris, pedicellis brevibus, calycis segmentis deltoideis, petalis orbicularibus, staminibus brevibus, fructu globoso parvo magnitudine pisi, semine solitario.

A much-branched erect shrub, with slender terete pubescent branchlets. Leaves rigid in texture, bright green, about an inch long, obtuse, deltoid at the base, crenulate, with fine slightly raised erecto-patent main veins. Cymes copious, axillary; pedicels $\frac{1}{12}$ in. long. Calyx campanulate, $\frac{1}{2}$ lin. in diam.; segments deltoid. Expanded corolla $\frac{1}{12}$ in. diam. Stamens shorter than the petals. Fruit brown, glabrous, the size of a pea, 1-seeded.—*Baron* 3147!

Elæodendron trachycladum, n. sp.

E. ramulis gracilibus dense pilosis, foliis alternis breviter petiolatis orbicularibus vel ovatis crenulatis rigidulis obscuris dorso obscure pubescentibus, cymis paucifloris axillaribus, floribus minutis pentameris, calycis segmentis deltoideis, petalis orbicularibus patulis, staminibus brevibus.

A shrub, with slender terete densely pubescent branchlets. Leaves about an inch long, nearly as broad as long, rounded at both ends, dull grey-green, moderately firm in texture, glabrous above, hairy principally on the midrib beneath, the fine erecto-patent main veins slightly raised. Cymes few-flowered, axillary; peduncle and pedicels both very short. Calyx campanulate, $\frac{1}{2}$ lin. in diam., pubescent. Expanded corolla 1 lin. in diam. Stamens half as long as the petals. Fruit unknown.—*Baron* 2878!

ELÆODENDRON GRISEUM, n. sp.

E. ramulis pubescentibus, foliis breviter petiolatis alternis ovatis vel orbicularibus subintegris rigidulis obscuris obscure pilosis, cymis paucifloris axillaribus, floribus minutis pentameris, pedicellis brevibus, calycis segmentis deltoideis, petalis orbicularibus patulis, staminibus brevibus.

A shrub, with slender terete pubescent branchlets. Leaves about an inch long, suborbicular or ovate, obtuse, entire or obscurely toothed, moderately firm in texture, dull grey-green, hairy mainly on the midrib beneath, the veins fine and immersed. Cymes copious, axillary, on short pubescent peduncles. Calyx campanulate, pubescent, $\frac{1}{2}$ lin. diam.; segments very small, broad, deltoid. Expanded corolla $\frac{1}{12}$ in. in diam. Immature fruit ovoid, glabrous, tipped with the short style.—*Baron* 2650!

SALACIA OLEOIDES, n. sp.

Glabra, foliis crassis rigide coriaceis lucidis integris breviter petiolatis ovatis vel oblongis, cymis axillaribus paucifloris corymbosis, pedicellis flore 2–3plo longioribus, sepalis petalisque orbicularibus, fructu globoso coriaceo.

A shrub, 8–16 ft. high, glabrous in all its parts, with slender terete rugose branchlets. Leaves opposite, shortly petioled, very thick and rigid in texture, quite entire, 2–3 in. long, $\frac{3}{4}$–$1\frac{1}{4}$ in. broad, obtuse, deltoid at the base, lucid, only the midrib distinctly visible. Cymes copious, axillary, corymbose; pedicels finally $\frac{1}{4}$–$\frac{1}{3}$ in. long. Calyx campanulate, $\frac{1}{12}$ in. in diam. Petals only seen immature. "Fruit dark brownish-green whilst on the tree," in the dried specimens globose, under an inch in diameter, very coriaceous in texture.—*Baron* 2837! Also gathered by Dr. Parker in the forest of Andrangaloaka.

SALACIA DENTATA, n. sp.

Glabra, ramulis rugosis, foliis brevissime petiolatis obovato-oblongis vel oblongis rigidis lucidis inciso-crenatis, cymis axillaribus multifloris umbellatis, pedicellis flore 2–3plo longioribus, sepalis petalisque orbicularibus, disco magno pentagono, filamentorum tubo ampullæformi, fructu magno turbinato.

A shrub, glabrous in all its parts, with terete woody branchlets. Leaves opposite, shortly petioled, 3–4 in. long, 1–$1\frac{1}{2}$ in. broad at the middle, acute, deltoid at the base, rigid in texture, glossy, distinctly crenate or dentate, the fine main veins raised beneath. Cymes copious, sessile, axillary, umbellate; pedicels finally $\frac{1}{4}$–$\frac{1}{3}$

in. long. Calyx campanulate, $\frac{1}{12}$ in. in diam.; sepals much imbricated. Expanded corolla $\frac{1}{3}$ in. in diam.; petals orbicular-unguiculate. Disk pentagonal, $\frac{1}{6}$ in. in diam. Stamen-column ampullæform, half as long as the petals. Immature fruit coriaceous, turbinate.—*Baron* 1256! 2184! 2866! &c. A near ally of *S. Calypso*, DC. (*Calypso*, Thouars, tab. 6).

TINA POLYPHYLLA, n. sp.

T. ramulis dense brunneo-pubescentibus, foliis pinnatis longe petiolatis, foliolis 23–27 oblongis acutis serratis subcoriaceis facie parce dorso dense pubescentibus, floribus in paniculam deltoideam dispositis, sepalis ovatis pilosis, petalis oblongis, ovario turbinato obscure piloso.

A tree, with the branchlets, peduncles, and leaf-rhachises densely clothed with short brown velvety pubescence. Petiole 3–4 in. long; lamina a foot long; leaflets 3–4 in. long, an inch broad, oblique at the base, distinctly serrated and stalked, obscurely pilose and green on the upper surface, brown-velvety especially on the raised very numerous main ribs beneath. Panicle half as long as the leaves, the lower branches compound; peduncle equalling the petiole. Calyx campanulate, $\frac{1}{2}$ line long, densely pilose. Petals and stamens twice as long as the sepals. Ovary turbinate, black, pilose, seated on a thick disk and narrowed into a short style.—*Baron* 2447! Differs from all the other species as described in Radlkofer's Monograph of the Cupanieæ, pp. 661–663, by its very numerous leaflets.

DODONÆA MADAGASCARIENSIS, *Radl. in Brem. Abhand.* viii. 470.

Glutinosa, pilosa, foliis imparipinnatis rhachi petioloque alatis, foliolis 8–10-jugis lanceolatis ciliatis, floribus dioicis in paniculas densas terminales dispositis, sepalis lanceolatis, staminibus circiter 20 antheris oblongis apiculatis filamentis brevissimis, fructu orbiculari compresso coriaceo biloculari alis deltoideis erectis.

A glutinose shrub, 4–5 feet high, with thick woody pubescent branchlets. Leaves imparipinnate, with a blade 4–6 in. long; rhachis winged between and above the leaflets, which are erecto-patent, sessile, acuminate, 1–2 in. long, ciliated, moderately firm in texture, unequal-sided towards the base. Flowers of both sexes in a dense terminal panicle, with pubescent branches; pedicel pubescent; bracts linear, persistent. Sepals lanceolate, $\frac{1}{6}$ in. long. Stamens 20, with oblong apiculate anthers $\frac{1}{6}$ in. long and very short filaments. Fruit an orbicular compressed bilocular coriaceous pubescent capsule $\frac{1}{3}$ in. long, with an erect deltoid wing on each side, and a very short style.—Sent twice by Mr. Baron. Also Hildebrandt 3604, from Andrangaloaka.

CALYCIFLORÆ.

ROUREA PLATYSEPALA, n. sp.

Arborea, glabra, foliis petiolatis pinnatis, foliolis 5–7 rigidulis ovatis acutis, floribus laxe copiose paniculatis, pedicellis flore longioribus, sepalis ovatis obtusis valde imbricatis, petalis oblongo-spathulatis calyce duplo longioribus, staminibus inclusis biseriatis antheris parvis, carpellis sessilibus ovoideis, stylo elongato, stigmate capitato.

A tree, glabrous in all its parts, with terete branchlets. Petiole 1–1½ in. long; leaflets 5–7, ovate, acute, petiolulate, 1–1½ in. long, rigid in texture, glossy, with a distinct brown midrib, the other veins fine and immersed. Panicles of numerous crowded lax racemes 1–2 in. long; pedicels slender, flexuose, $\frac{1}{4}$ in. long. Calyx campanulate, $\frac{1}{12}$ in. long; sepals ovate, obtuse, much imbricated, the two inner quite hidden by the three outer. Petals oblong-unguiculate, $\frac{1}{6}$ in. long. Stamens with long filaments and short globose anthers. Carpels more than one, with a produced style and capitate stigma. Fruit not seen.—*Baron* 2528! Nearly allied to the East-Indian *R. santaloides*, Wight & Arn.

NEOBARONIA, genus novum Dalbergiearum.

Calyx parvus, campanulatus, dentibus minutis deltoideis. Corolla papilionacea, petalis æquilongis; vexillum obovatum obtusum unguiculatum; alæ angustiores; carina navicularis recta subacuta. Stamina 10 diadelpha, filamentis 9 in tubo apice fisso connatis, supremo libero filiformi, antheris parvis globosis. Ovarium sessile lineare, ovulis paucis, stylo brevi abrupte incurvato, stigmate capitato. Legumen coriaceum indehiscens turgidum 1–2-spermum, apice et basi attenuatum.—Arbor Madagascariensis, ramulis in phyllocladiis rigidulis oblanceolatis triplo compositis mutatis, foliis propriis nullis, floribus parvis ad dentes phyllocladiarum impositis, pedicellis brevibus, bracteis minutis deltoideis.

Mr. Baron has been at last successful in procuring flowers and fruit of a very curious plant, which has puzzled us for a long time. We had specimens without either, long ago from Bojer and Meller, consisting of triply compound phyllocladia with distantly-toothed margins. In my last paper (Journ. Linn. Soc. vol. xx. p. 249) I described it as a doubtful *Exocarpus*, and it was named in manuscript by Bojer *Xylophylla ensifolia*. Now

Mr. Baron (No. 3139) has obtained full material, from which the following notes are made. It is well known to the natives under the name of Harahara, and the wood is very hard and valuable. I fear that the genus which I named *Baronia* in Trimen's Journal, 1882, p. 67, will have to be merged in *Rhus*, and so I have called this very characteristic and peculiar Madagascar type after Mr. Baron again, with a slight variation in the name to avoid confusion.

NEOBARONIA PHYLLANTHOIDES, *Baker*, sp. unica.

A high tree, glabrous in all its parts, with very hard wood. Branchlets woody, subterete, widening gradually into the primary phylloclades, which are oblanceolate, 4–5 inches long, under an inch broad, rigid in texture, green on both surfaces, distantly minutely toothed on the margin, with fine immersed uniform anastomosing vertical veins. From the edge of primary phylloclades spring others, and these are sometimes again compound. From the teeth of the margin spring little clusters of flowers on short pedicels, with a minute deltoid bract at the base. The persistent glabrous brown calyx is $\frac{1}{8}$ in. long and broad, with minute deltoid teeth. Corolla papilionaceous, bright purple, $\frac{1}{3}$ in. long. Stamens diadelphous, the upper filament free, and the others united in a sheath; anthers minute, globose. Ovary linear, sessile, with a short abruptly incurved style and capitate stigma. Pod coriaceous, indehiscent, not at all compressed, $\frac{1}{2}$ in. in diam., $1\frac{1}{4}$–$1\frac{1}{2}$ in. long, 1–2-seeded, narrowed into a stalk at the base and a beak at the apex.

DALBERGIA BARONI, n. sp.

Arborea, ramulis pilosis, foliis pinnatis breviter petiolatis, foliolis 15–25 oblanceolato-oblongis rigidis 1-nervatis dorso nervatis, floribus in paniculas parvas deltoideis dispositis, calycis dentibus latis, petalis calycem duplo superantibus, staminibus monadelphis, legumine tenui rigido 1–2-spermo.

A much-branched erect tree, with pilose branchlets. Leaves 2–4 in. long, exclusive of the short petiole; leaflets opposite or alternate, with a short petiolule, obtuse, $\frac{1}{2}$–$\frac{3}{4}$ in. long, firm in texture, the margin rather recurved, pilose only on the prominent midrib beneath, the other veins invisible. Flowers in small deltoid panicles with pubescent branchlets; pedicels very short. Calyx campanulate, $\frac{1}{12}$ in. long, with an ovate bracteole at the base; teeth half-orbicular. Corolla $\frac{1}{6}$ in. long. Filaments all united in the lower half in a sheath slit along the top; anthers minute, globose. Pod straight, oblong, thin, rigid, brown, 1–2-seeded, stipitate, 1–2 in. long, $\frac{1}{2}$–$\frac{5}{8}$ in. broad, very little thickened against the seeds, but with copious veins radiating from them. —*Baron* 2598! A valuable timber. Native name "Voamboana."

CADIA PEDICELLATA, n. sp.

Arborea, ramulis glabris, foliis breviter petiolatis imparipinnatis, foliolis 11–17 oblongo-oblanceolatis obtusis rigidulis oppositis vel alternis, racemis axillaribus paucifloris, pedicellis longissimis, bracteis linearibus, calycis magni dentibus deltoideis, petalis obovatis calyce sesquilongioribus, staminibus petalis æquilongis, ovario lineari stipitato.

A tree, glabrous in all its parts, with angled slender branchlets. Leaves crowded, 3–4 in. long; leaflets about an inch long, shortly stalked, firm in texture, green and glabrous on both surfaces, entire, minutely emarginate at the apex. Racemes 2–3-flowered, axillary, much shorter than the leaves; pedicels slender, glabrous, ascending, 1–1$\frac{1}{2}$ in. long; bracts minute, linear. Calyx campanulate, greenish, glabrous, $\frac{5}{8}$ in. long; teeth $\frac{1}{3}$–$\frac{1}{4}$ as long as the tube. Petals obovate, imbricated, an inch long. Stamens as long as the petals; anthers minute, oblong, versatile. Ovary linear, glabrous, stipitate. Legume not seen.—*Baron* 2248! Near *C. pubescens*, Bojer, described in my last paper, Journ. Linn. Soc. xx. p. 135.

MIMOSA DASYPHYLLA, n. sp.

***M.* ramulis validis angulatis aculeis crebris minutis sparsis armatis, foliis amplis bipinnatis, pinnis 7–8-jugis, foliolis 10–12-jugis oblongis petiolulatis utrinque pubescentibus, floribus copiose paniculatis, calycis dentibus deltoideis, corollæ segmentis lanceolato-deltoideis, staminibus exsertis, legumine curvato tenui stipitato 6–8-spermo suturis inermibus.**

Branchlets stout, woody, strongly angled, brown, shining, armed with copious scattered small hooked prickles. Leaves half a foot long, including the 1–1$\frac{1}{2}$ in. petiole, with a prickly rhachis; pinnæ 2–2$\frac{1}{2}$ in. long; leaflets $\frac{1}{3}$ in. long, moderately firm in texture, with an excentric midrib, grey and densely pubescent beneath, green and less pubescent above. Flowers in an ample deltoid terminal panicle with prickly branches. Calyx one third as long as the funnel-shaped corolla, which is $\frac{1}{12}$ in. long. Pod thin, strap-shaped, curved, distinctly stipitate, 4–5 in. long, $\frac{1}{2}$–$\frac{5}{8}$ in. broad, thickened a little opposite the 6–8 seeds.—*Baron* 2426! Allied to *M. nissobiensis*, Benth.

MIMOSA MYRIACANTHA, n. sp.

M. ramulis validis lignosis aculeis crebris sparsis minutis uncinatis armatis, foliis amplis bipinnatis, pinnis 9–10-jugis, foliolis sessilibus oblongo-quadratis 8–9-jugis dorso pubescentibus, floribus copiose paniculatis, calycis dentibus deltoideis, corollæ segmentis lanceolato-deltoideis, staminibus exsertis, legumine oblique oblongo obtuso tenui glabro 3–4-spermo suturis aculeis minutis stramineis uncinatis copiosis armatis.

Branchlets terete, woody, armed with copious minute scattered prickles. Leaves about half a foot long, shortly petioled, imbricated; rhachis pubescent, slightly prickly; pinnæ 1½–2 in. long; leaflets ¼–⅓ in. long, obtuse, moderately firm in texture, cut away obliquely on the upper side at the base. Flowers arranged in an ample terminal panicle, with pubescent prickly branches. Calyx one third as long as the corolla, which is funnel-shaped, $\frac{1}{12}$ in. long, with teeth nearly as long as the tube. Legume sessile, thin, brown, crustaceous, rather oblique, about 2 in. long, ¾ in. broad, finely veined transversely, not much thickened opposite the seeds, both sutures armed with copious hooked straw-coloured prickles.—*Baron* 2597! A near neighbour of the East-Indian *M. hamata*, Willd.

WEINMANNIA MINUTIFLORA, n. sp.

Glabra, foliis petiolatis trifoliolatis, foliolis rigide coriaceis obtusis serratis lateralibus oblongis terminali obovato basi longe attenuato, floribus minutis in racemos subspicatos longissimos dispositis, calycis dentibus deltoideis, ovario ovoideo sericeo, stylis ovario æquilongis.

A shrub or small tree, with glabrous branchlets and leaves. Petiole ½–¾ in. long; leaflets rigid in texture, green on both surfaces, very obtuse, minutely dentate, with parallel raised erecto-patent main veins beneath, the side ones oblong, sessile, erecto-patent, 1–1½ in. long, the end ones considerably larger and narrowed very gradually into a winged petiolule. Racemes copious, shortly peduncled, 4–6 in. long; axis stout, angled. Calyx campanulate, ½ lin. in diam., sessile or obscurely pedicellate; teeth 5, deltoid. Corolla not seen. Pistil $\frac{1}{12}$ in. long, the styles equalling the ovoid densely-silky ovary.—*Baron* 2547!

WEINMANNIA FRAXINIFOLIA, n. sp.

Glabra, foliis pinnatis, foliolis 7–9 oblongo-lanceolatis acutis serratis rigidis nitidulis, floribus in spicas elongatas cylindricas dispositis, calycis dentibus magnis, ovario magno ovoideo sericeo, stylis ovario æquilongis.

A tree, with glabrous branches and leaves. Leaves distinctly petioled, 4–5 in. long; leaflets 7–9, firm and rigid in texture, glossy, green on both surfaces, $1\frac{1}{2}$–2 in. long, $\frac{1}{2}$–$\frac{3}{4}$ in. broad, strongly inciso-crenate, sessile, narrowed to the base, the erecto-patent main veins distinct beneath. Spikes copious, cylindrical, peduncled, 3–4 in. long. Calyx campanulate, $\frac{1}{8}$ in. in diam., with 5 large ovate obtuse segments. Petals not seen. Pistil $\frac{1}{4}$ in. long, the slender styles as long as the ovoid densely drab-silky ovary.—*Baron* 3148!

KITCHINGIA SCHIZOPHYLLA, n. sp.

Perennis, glabra, caule tereti, foliis petiolatis lanceolato-deltoideis carnosis pinnatis segmentis distantibus linearibus deflexis, cymis paucifloris in paniculam laxam deltoideam dispositis, pedicellis flexuosis calyce longioribus, calycis tubo campanulato segmentis deltoideis cuspidatis, corolla rubra calycem 4plo superante, stylis elongatis.

A glabrous perennial. Fully-developed leaves 4–5 in. long, including the petiole, consisting of a few deflexed entire linear segments, the lowest about an inch long, the upper growing gradually shorter. Cymes few-flowered, arranged in a very lax large terminal panicle; pedicels slender, flexuose, $\frac{1}{4}$–$\frac{1}{3}$ in. long. Calyx campanulate, $\frac{1}{6}$ in. long and broad; segments deltoid-cuspidate, longer than the campanulate tube. Corolla bright red, only seen in a withered state. Fruit-carpels twice as long as the calyx; styles as long as the carpels. Anthers minute.—*Baron* 3132!

MYRIOPHYLLUM AXILLIFLORUM, n. sp.

***M.* caulibus floriferis elongatis, foliis verticillatis sæpissime quaternis ascendentibus firmulis lanceolatis superioribus serratis inferioribus pectinato-pinnatifidis, floribus omnibus axillaribus, superioribus masculis petalis 4 oblongis, inferioribus fœmineis ovario acute 4-angulato vittis tuberculatis petalis 4 parvis.**

Leafy floriferous stems simple, branching off from a wide-creeping rootstock. Leaves rather firm in texture, sessile, ascending, four in a whorl, lanceolate, $\frac{1}{3}$–$\frac{1}{2}$ in. long, the upper faintly toothed, the lower pectinate-pinnatifid. Flowers in the axils of all the whorls down nearly to the bottom of the branches, those of the upper whorls all male, of the lowest female. Male flowers with 4 oblong petals and 4 linear-oblong anthers, with short filaments. Female flowers with 4 small petals and an acutely-angled globose 4-celled ovary, rugose on the four keels.—

Baron 3325! Also *Hildebrandt* 4030! Allied to *M. verticillatum*, L. Mr. Baron has also gathered lately in Central Madagascar the Cape *Gunnera perpensa*, L. (2238!)

WEIHEA SESSILIFLORA, n. sp.

Glabra, foliis petiolatis rigidulis obovato-oblongis acuminatis sursum serratis, floribus ad nodos 2–4-nis axillaribus sessilibus, bracteolis coriaceis orbicularibus, calycis tubo campanulato segmentis parvis semiorbicularibus, petalis dorso sericeis, antheris oblongis.

A tree, glabrous in all its parts, with woody branchlets dilated below the nodes. Leaves opposite, distinctly petioled, rigid in texture, green on both surfaces, 4–5 in. long, 1½–2 in. broad, lengthened out at the point, serrated in the upper half, entire in the lower half, deltoid, the base distinctly penninerved. Flowers 2–4 in a sessile cluster at the nodes, seen only in an early stage; bracteoles orbicular, coriaceous, entire or cleft. Calyx-segments semiorbicular. Corolla globose in bud, silky on the outside. Anthers numerous, oblong.—*Baron* 2583!

EUGENIA (§ SYZYGIUM) LOISELEURIOIDES, n. sp.

Glabra, foliis parvis petiolatis obovatis rigidis, cymis terminalibus parce paniculatis, pedicellis brevissimis, calycis tubo cuneato segmentis latis rotundatis brevissimis, petalis parvis orbicularibus, staminibus circiter 30 calycis tubo brevioribus.

A much-branched shrub, glabrous in all its parts, with slender square branchlets. Leaves shortly petioled, about ½ in. long, very obtuse, deltoid at the base, rigid in texture, the veins of the under surface fine, erecto-patent, reticulated. Cymes few-flowered; pedicels very short. Calyx brown, glabrous, coriaceous, obconical, $\frac{1}{12}$ in. long and broad. Petals minute, orbicular. Stamens not above $\frac{1}{12}$ in. long.—*Baron* 2641!

HOMALIUM (§ BLACKWELLIA) CONFERTUM, n. sp.

Glabrum, foliis obovato-oblongis sessilibus rigidulis serratis obtuse cuspidatis, floribus in spicas ascendentes strictas paucifloras dispositis, bracteis coriaceis oblongis, calycis tubo globoso piloso segmentis 5–6 oblanceolatis rigidulis, petalis 5 oblongis sericeis, staminibus isomeris.

A tree, with the leaves crowded on the glabrous branchlets. Leaves firm in texture, green on both surfaces, 2½–3 in. long, 1–1¼ in. broad, distinctly serrated, shortly cuspidate at the tip, narrowed to a rather rounded base, the secondary veins distinct, erecto-patent, parallel. Flowers few, in shortly-peduncled stiff spikes, each subtended by an orbicular coriaceous persistent bract. Calyx with a campanulate tube, and usually 5 oblanceolate rigid persistent brown segments $\frac{1}{4}$ in. long. Petals cucullate, tomentose, much shorter than the calyx-segments, each enclosing a single stamen.—*Baron* 3185! 3256!

Veprecella hispida, n. sp.

Fruticosa, ramulis gracilibus dense hispidis, foliis petiolatis ovatis acutis membranaceis integris trinervatis utrinque hispidis, cymis terminalibus laxe paniculatis, pedicellis elongatis, calycis tubo campanulato hispido dentibus minutis, petalis rubellis oblongo-spathulatis, antheris æqualibus obscure calcaratis, stylo antheris longiore.

A shrub, 6–10 feet high, with slender square branchlets, densely clothed with deflexed brownish bristly hairs. Leaves distant, distinctly petioled, ovate, acute, entire, membranous, 2–3 in. long, bright green above, pale green beneath, thinly bristly on both surfaces and the margin. Flowers in a lax terminal panicle with cymose branches, both peduncles and pedicels densely bristly. Calyx with a campanulate densely bristly green tube $\frac{1}{6}$ in. in diam., and an obscurely-toothed narrow collar-like limb. Petals bright red, $\frac{1}{3}$ in. long. Stamens 8, shorter than the petals; filaments filiform; anthers yellow, sausage-shaped, obscurely spurred by the connective on the back at the base. Style clavate, overtopping the stamens.—*Baron* 420! 3257! Also, forest of Andrangaloaka, *Dr. Parker*!

Phornothamnus, genus novum tribus Oxysporearum, ordinis Melastomacearum.

Calyx glaber, tubo campanulato persistente ovario adnato, limbo brevi erecto obscure lobato. Petala 4–5 oblongo-spathulata, obtusa. Stamina 8–10 petalis breviora, filamentis applanatis, antheris lineari-oblongis apice obscure cuspidatis uniporosis basi connectivo producto dorso obscure calcaratis. Ovarium globosum 4–5-loculare basi calyci adnatum. Capsula globosa coriacea ad basin loculicide 4–5 valvis, valvis persistentibus rigidis oblongis, axi septis persistentibus late alato.—Suffrutex Madagascariensis ramosissima humifusa, ramulis foliisque lepidotis, foliis parvis oblongis petiolatis rigidis obscure trinervatis, floribus terminalibus purpurascentibus breviter pedunculatis sæpissime solitariis, setis nullis.

P. thymoides, *Baker*, sp. unica.

A densely-matted trailing undershrub, with the habit of *Loiseleuria procumbens.* Branchlets and leaves copiously dotted over with minute brown scales. Leaves opposite, oblong, entire, coriaceous, shortly petioled, $\frac{1}{8}$–$\frac{1}{6}$ in. long, with three obscure nerves arising from the base, of which only the midrib is produced to the tip. Flowers generally solitary at the end of the branchlets on a short peduncle. Calyx brown, glabrous, campanulate, $\frac{1}{12}$ in. in diam., with an obscurely lobed narrow erect limb. Corolla glabrous, conical in bud, bright red-purple; fully-developed petals oblong-spathulate, $\frac{1}{4}$–$\frac{1}{3}$ in. long. Stamens equal, as long as the petals; filaments as long as the linear-oblong anthers, which have a single pore at the top, and are obscurely spurred on the back at the base by the produced connective. Capsule globose, $\frac{1}{4}$ in. in diam., split down to the base into 4–5 oblong rigid valves, girt at the base by the persistent truncate cup-shaped coriaceous brown calyx.—*Baron* 1314, in fruit! Also *Humblot* 535, in flower! Allied to *Veprecella* and *Rousseauxia*, but in habit resembling one of the Brazilian Microlicieæ.

MEMECYLON OLEÆFOLIUM, n. sp.

Glabrum, ramosissimum, foliis subsessilibus rigidulis oblongis obtusis obscure penninerviis basi deltoideis dorso nigro punctatis, cymis axillaribus paucifloris pedunculatis, pedicellis brevibus, calycis tubo campanulato limbo lato obscure dentato, petalis ovatis, staminibus inclusis, antheris basi acutis, stylo elongato.

A much-branched erect shrub, glabrous in all its parts. Leaves contiguous, nearly sessile, 1–1$\frac{1}{2}$ in. long, deltoid at the base, rigid in texture, brownish above when dried, bright green beneath with copious minute immersed black dots, with a distinct midrib from base to apex, and obscure erecto-patent parallel secondary veins. Cymes copious, axillary, shortly peduncled, 3–5-flowered; pedicels glabrous, $\frac{1}{12}$–$\frac{1}{8}$ in. Calyx brown, glabrous, coriaceous, with a campanulate tube and a broad coriaceous obscurely toothed collar-like limb $\frac{1}{8}$ in. in diam. Bud conical; petals greenish, ovate, acute, $\frac{1}{8}$ in. long. Stamens 8; filaments filiform. Anthers curved, acute at the base. Style filiform, $\frac{1}{4}$ in. long.—*Baron* 2233! 3195! Allied to *M. Elæagni*, Blume.

MEDINILLA LEPTOPHYLLA, n. sp.

Glabra, ramulis gracilibus, foliis sessilibus oblongis acuminatis membranaceis trinervatis, cymis laxis paucifloris pedunculatis, pedicellis elongatis bracteolatis, calycis tubo campanulato limbo integro, petalis oblongo-spathulatis pallide rubris, staminibus inclusis antheris basi calcaratis.

A shrub, glabrous in all its parts, with slender woody branchlets, with a few lenticels. Leaves sessile, about 2 in. long, under an inch broad, acuminate, thin in texture, tinged with purple when young, distinctly 3-nerved. Cymes axillary, 3–5-flowered, distinctly peduncled; lateral pedicels $\frac{1}{4}$–$\frac{1}{2}$ in. long, very slender, with a pair of minute bracteoles at the middle. Calyx green, with a campanulate tube $\frac{1}{8}$ in. in diam., and a broad truncate limb. Petals oblong-spathulate, $\frac{1}{4}$ in. long. Stamens $\frac{1}{6}$ in. long; anthers linear-oblong, distinctly spurred at the base.—*Baron* 3221!

MEDINILLA LANCEOLATA, n. sp.

Glabra, ramulis gracilibus lenticellis rugosis, foliis breviter petiolatis lanceolatis rigidulis acutis uninerviis, cymis axillaribus paucifloris, pedicellis brevibus, calycis tubo campanulato limbo lato obscure dentato, petalis pallide rubellis latis obtusis, staminibus inclusis antheris basi obscure calcaratis.

A shrub, glabrous in all its parts, with very slender woody branchlets, rough with large lenticels. Leaves shortly petioled, lanceolate, firm in texture, $1\frac{1}{2}$–2 in. long, $\frac{1}{4}$–$\frac{1}{3}$ in. broad, narrowed gradually from the middle to a long point, with no veins visible except the distinct midrib. Cymes sessile or shortly peduncled, axillary; pedicels $\frac{1}{6}$ in., with a pair of small bracteoles. Calyx green, with a campanulate tube $\frac{1}{12}$ in. in diam., and an obscurely lobed broad collar-like limb. Petals pale red, $\frac{1}{6}$ in. long. Stamens shorter than the petals; anthers linear-oblong, obscurely spurred at the base. Style as long as the petals.—*Baron* 2983!

MEDINILLA LOPHOCLADA, n. sp.

Glabra, ramis crassis acute tetragonis lenticellis rugosis, foliis magnis oblongis coriaceis sessilibus 7-nervatis, cymis sessilibus axillaribus multifloris, pedicellis flore brevioribus, calycis tubo campanulato, limbo lato obscure lobato, petalis latis obtusis, staminibus 10 inclusis æqualibus antheris basi calcaratis.

A shrub, glabrous in all its parts, with acutely-angled tetragonous woody branchlets $\frac{1}{4}$ in. in diam., rugose between the raised ribs with copious lenticels. Leaves rigid in texture, green on both sides, 5–6 in. long, 2–3 in. broad at the middle, obtuse or subobtuse, narrowed to the base, with 7 thick ribs produced from the base to the apex. Cymes many-flowered, axillary; pedicels $\frac{1}{6}$–$\frac{1}{4}$ in. Calyx bright red, glabrous, with a campanulate tube $\frac{1}{8}$ in. in diam., and a broad collar-like obscurely lobed limb. Petals 5, red, oblong-spathulate, obtuse, $\frac{1}{4}$–$\frac{1}{3}$ in. long. Stamens

10, shorter than the petals; anthers linear-oblong, shortly spurred on the back at the base. Style filiform, as long as the petals.—*Baron* 3249!

AMMANNIA CRYPTANTHA, n. sp.

Perennis, glabra, caulibus tetragonis, foliis sessilibus oblongis integris, floribus racemosis, singulis bractea ovata cucullata cinctis, calycis tubo campanulato dentibus 5 deltoideis, petalis 5 parvis oblanceolatis, staminibus in tubo calycis inclusis, stylo elongato.

Stems ascending from a trailing perennial rootstock, tetragonous, simple in the lower half, copiously branched upwards. Leaves opposite, oblong, sessile, $\frac{1}{4}$–$\frac{1}{3}$ in. long. Panicle of few or many ascending rather lax racemes $\frac{1}{2}$–1 in. long, each flower hidden by a clasping ovate foliaceous bract, with a short pedicel inside the bract. Calyx $\frac{1}{8}$ in. long, with a campanulate tube and 5 deltoid segments. Petals 5, oblanceolate, twice as long as the calyx-lobes. Stamens inserted near the base of the calyx-tube; filaments filiform; anthers minute, orbicular. Ovary ovoid; style $\frac{1}{8}$ in. long.—*Lyall* 213! *Baron* 476! 1902! Near the East-Indian *A. rotundifolia*, Wight.

EPILOBIUM OLIGANTHUM, n. sp.

E. caule tereti gracili superne tomentoso, foliis subsessilibus lanceolatis glabris superne denticulatis, floribus paucis laxe corymbosis, ovario cylindrico tomentoso, calycis segmentis lanceolatis, petalis magnis obovatis, stigmate magno integro quadrato, staminibus stylo brevioribus.

Stems erect, slender, terete, glabrous except towards the top, where they are white-tomentose. Leaves lanceolate, sessile, glabrous, erecto-patent, 1–1$\frac{1}{2}$ in. long, denticulate upwards. Flowers few, in a lax terminal corymb, wavy, cylindrical, white-tomentose, above an inch long. Calyx-limb pilose, $\frac{1}{3}$ in. long, with a campanulate tube and lanceolate segments. Petals obovate-cuneate, red, $\frac{1}{2}$ in. long. Style shorter than the petals; stigma large, quadrate, entire. Stamens much shorter than the style.—*Baron* 2269! Allied to the European *E. palustre*, L.

MODECCA PELTATA, n. sp.

Volubilis, glabra, ramulis gracilibus lignosis, cirrhis nullis, foliis simplicibus ovatis integris acutis membranaceis petiolo supra basin affixis, cymis axillaribus paucifloris pedicellis elongatis, floribus masculis calycis tubo infundibulari viridulo, segmentis 5 lanceolatis reflexis tubo longi-

oribus, petalis 5 albis oblanceolatis ad faucem calycis insertis, corona nulla, staminibus 5 antheris linearibus, filamentis brevibus applanatis infra oram calycis insertis.

A glabrous climber, with slender terete woody stems with a membranous brown epidermis. Leaves distant, simple; petiole slender, about an inch long, attached a little above the base of the ovate membranous blade, which is 2–3 in. long. Male flowers only seen, arranged in axillary cymes; pedicels slender, $\frac{1}{2}$–$\frac{3}{4}$ in. long. Calyx greenish, glabrous, with a funnel-shaped tube $\frac{1}{3}$ in. long, and 5 reflexing lanceolate segments rather longer than the tube. Petals 5, whitish, lanceolate, $\frac{1}{4}$ in. long, inserted at the throat of the calyx. Anthers 5, linear, erect, $\frac{1}{4}$ in. long, with short flattened filaments inserted a little below the throat of the calyx-tube.—*Baron* 2827!

MELOTHRIA (§ ZEHNERIA) EMIRNENSIS, n. sp.

Volubilis, glabra, dioica, foliis longe petiolatis cordato-ovatis acutis denticulatis cuspidatis membranaceis facie obscure scaberulis, floribus masculis copiose racemosis, fœmineis in umbellas axillares paucifloris sæpissime dispositis raro solitariis, fructu subgloboso lacunoso, seminibus discoideis obscure marginatis.

A glabrous herbaceous twiner, with slender angled smooth stems, with a long simple tendril from each node much twisted spirally towards the tip. Petiole 1–2 in. long; blade 2–3 in. long, cordate-ovate, with a deep basal sinus, irregularly patent deltoid-cuspidate teeth, and a distinct mucro, thin in texture, green on both surfaces, obscurely scattered over with white points and rudimentary bristles on the upper surface. Male flowers in copious axillary racemes; calyx minute, campanulate. Female flowers in peduncled axillary umbellate cymes, rarely solitary. Ovary oblong, narrowed into a short cylindrical neck. Calyx-tube campanulate, under $\frac{1}{8}$ in. long and broad, densely hairy inside; teeth minute, deltoid. Petals 5, small, oblong, inserted at the throat of the calyx-tube. Stigma placed opposite the tip of the petals. Berry $\frac{1}{3}$–$\frac{1}{2}$ in. in diam., brown when mature, conspicuously pitted all over the epidermis. Seeds whitish, obovoid-discoid, $\frac{1}{6}$ in. long, obscurely margined.—*Baron* 390! 397! 2821! *Parker*! Mr. Baron has also rediscovered (2348! 2620! 2661!) *M. Rutenbergiana*, Cogn. in Rel. Rutenb. ii. p. 251.

BEGONIA (§ QUADRILOBARIA) HETEROPODA, n. sp.

Acaulis, stipulis magnis ovatis scariosis persistentibus, petiolis elongatis pilis reflexis brunneis persistentibus vestitis, limbo cordato-rotundato membranaceo obscure palmatifido irregulariter dentato, scapo elongato glabro, floribus masculis sepalis 2 cordato-orbicularibus rubellis petalis nullis antheris 20–30 lineari-oblongis filamentis brevissimis liberis.

Acaulescent. Stipules large, ovate, scariose, persistent; petiole 3–4 in. long, densely clothed with reflexed persistent brown paleaceous hairs; blade orbicular, membranous, broader than long, 6–9 in. broad, with a deltoid basal sinus 1½ in. deep, obscurely palmatifid, the margin *irregularly dentate*, the upper surface glabrous, the main veins beneath with a few hairs like those of the petiole. Cyme in the only specimen of 10–12 exclusively male flowers; peduncle naked, slender, fragile, 6–8 in. long; bracts ovate, membranous, folded together. Male flower-wrapper of two purplish-red cordate-orbicular sepals ⅓ in. broad. Stamens 20–30, with linear-oblong anthers ⅙ in. long and very short filaments.—*Baron* 3295! Allied to *B. nossibæa*, A. DC. Mr. Baron (2443 !) has also rediscovered the very curious *B. Lyallii*, A. DC.

RHIPSALIS HORRIDA, n. sp.

Lignosa, copiose ramosa, ramulis ultimis clavatis vel cylindricis basi attenuatis verticaliter multisulcatis, pilis dense cæspitosis rigidulis inæqualibus fragilibus, floribus lateralibus sessilibus 1–3nis, fructu carnoso globoso glabro vel parce piloso magnitudine pisi.

Stems woody, terete, copiously branched, calvate when very old, pale green, ⅙ in. in diam., fleshy when young, with irregular slender vertical ribs and densely scattered pulvilli of almost hyaline, unequal, fragile rather bristly hairs ⅛–⅙ in. long. Berries 1–3nate, sessile, lateral, fleshy, globose, the size of a pea, glabrous except at the apex, or with a casual pulvillus of hairs like those of the branches. Flowers not seen.—*Baron* 2750! 3269!

TELEPHIUM MADAGASCARIENSE, n. sp.

Perenne, glabrum, caulibus decumbentibus, foliis alternis sessilibus oblongis, stipulis scariosis deltoideis persistentibus, cymis decompositis laxis, pedicellis brevibus, sepalis 5 oblongis valde imbricatis, petalis vix exsertis, staminibus calyce æquilongis, ovario ovoideo, stylis 3 falcatis.

A glabrous perennial herb, with decumbent stems half a foot long. Leaves alternate, sessile, oblong, obtuse, ½–¾ in. long, deltoid at the base; stipules minute, persistent, scariose. Cymes decompound, lax, terminal, 2–3 in. in diam.; branches arcuate; pedicels short, with a small deltoid white-edged bract at the base. Calyx campanulate, $\frac{1}{8}$ in. long; petals 5, herbaceous, oblong, obtuse, much imbricated, whitish at the edge. Petals oblong, scarcely longer than the calyx. Stamens 5, distinctly perigynous; anthers small, globose, placed opposite the tip of the sepals. Pistil shorter than the calyx; ovary ovoid; styles falcate, as long as the ovary.—*Baron* 1909! This genus belongs to the Mediterranean region, and is not known in Tropical Africa or at the Cape.

HYDROCOTYLE FILICAULIS, n. sp.

H. caulibus filiformibus glabris late reptantibus, foliis cæspitosis orbicularibus basifixis glabris inciso-crenatis basi truncatis petiolis pubescentibus, floribus paucis in umbellas pedunculatas solitariis dispositis, bracteis ovatis, pedicellis brevissimis, fructu globoso jugis 5 inconspicuis, stylis falcatis.

Stems wide-trailing, filiform, glabrous, rooting from the tufts, with several leaves, and a single peduncled umbel of flowers. Petiole pubescent, $\frac{1}{4}$–$\frac{1}{2}$ in. long; blade orbicular, glabrous, $\frac{1}{4}$–$\frac{1}{2}$ in. broad, almost truncate at the base, inciso-crenate. Flowers 2–6 in an umbel; pedicels very short; bracts ovate, persistent, longer than the pedicels. Fruit orbicular, $\frac{1}{12}$ in. diam.; mericarps turgid, oblong, obscurely ribbed; styles short, cylindrical, distinctly falcate.—*Baron* 3219! Allied to *H. asiatica*, L.

HYDROCOTYLE SUPERPOSITA, n. sp.

Glabra, rhizomate filiformi late reptante, foliis solitariis longe petiolatis peltatis orbicularibus crenatis membranaceis 9–10-nervis, floribus spicatis verticillis 2–4 superpositis, bracteis ovatis, fructu globoso, mericarpiis jugis 5 prominulis præditis, petalis parvis ovatis, stylis rectiusculis brevissimis.

Rhizome filiform, wide-trailing, sending out tufts of root-fibres from the nodes. Leaves solitary, glabrous, with a slender petiole 1–2 in. long; blade orbicular, peltate, $\frac{1}{2}$–$\frac{3}{4}$ in. broad, membranous, crenate. Flowers in spikes of 2–4 superposed whorls of 4–6 flowers each, with a slender peduncle 1–$1\frac{1}{2}$ in. long; bracts minute, persistent. Fruit globose, laterally compressed, $\frac{1}{8}$ in. diam.; mericarps with a distinct ridge on each side midway between the back and margin; style very short, cylindrical, nearly straight. Petals ovate, minute, valvate.—*Baron* 1897!

PIMPINELLA LAXIFLORA, n. sp.

Perennis, glabra, caule gracili foliato, foliis petiolatis trifoliolatis, foliolis oblongis acutis dentibus latis cuspidatis, umbellis compositis in paniculam magnam laxissimam dispositis, bracteis bracteolisque minutis lanceolatis, pedicellis longissimis, fructu oblongo glabro jugis parum prominulis, calycis limbo obsoleto, stylopodiis conicis, stylis brevissimis falcatis.

A glabrous perennial, with slender terete suffruticose stems. Stem-leaves several, contiguous, long-petioled; leaflets moderately firm in texture, acuminate, 2–3 in. long; side ones nearly sessile, very unequal at the base; end ones distinctly stalked, deltoid at the base; umbels 5–6nate; peduncles very slender, 1–2 in. long; pedicels 3–6nate, ½–1½ in. long. Fruit oblong, $\frac{1}{12}$ in. long, with 5 equal indistinct ribs on each mericarp. Petals not seen. Stylopodia conic; styles very short, spreading.—*Baron* 290! 2887!

PHELLOLOPHIUM, genus novum tribus Seselinearum, ordinis Umbelliferarum.

Calycis dentes obsoleti. Petala oblonga apice inflexa. Stylopodia conica in stylum brevem falcatum attenuata. Fructus oblongus teres ad commissuram haud constrictus, carpellis facie planis, dorso rotundatis, jugis 5 crassis stramineis suberosis subæqualibus, valleculis profundis angustis. Vittæ ad valleculas solitariæ. Carpophorum filiforme bifidum. Semen rectum, facie commisurali leviter bisulcato, dorso rotundato jugis 5 prominulis prædito.—Herba glabra erecta robusta orgyalis, foliis radicalibus bipinnatis, foliolis magnis oblongis petiolo basi late dilatato, umbellis compositis copiose paniculatis, bracteis bracteolisque paucis parvis linearibus.

P. MADAGASCARIENSE, *Baker*, sp. unica.

An erect robust perennial herb, 5 or 6 feet high, with many-angled hollow stems. Lower leaves bipinnate, deltoid, with a petiole much dilated, and sheathing at the base; pinnæ 5–6-jugate; leaflets oblong, sharply toothed, 2–3 in. long, the upper sessile, the lower shortly petioled. Compound umbels forming a panicle a foot long, with level-topped divisions; secondary umbels and flowers both about in twelves; bracts and bracteoles few, linear, entire, conspicuous. Petals not well seen; according to Mr. Baron's note, ovate-lanceolate, greenish-white. Calyx-limb entirely obsolete. Fruit oblong, ¼ in. long, ⅛ in. in diam., terete in transverse section, with 5 very thick straw-coloured nearly equal corky ribs on each mericarp. Seed aromatic, faintly bisulcate on the face, with a distinct ridge opposite each of the great corky ridges of the fruit.—*Baron* 60! 1814! 2227! *Hildebrandt* 3868! Used as a tooth-ache remedy. Native name "Tsileondroaha." Habit of *Angelica*, but allied to *Seseli* and *Fœniculum*, from which it differs by its thick corky ribs and narrow very deep valleculæ, and entirely obsolete calyx-limb.

CUPHOCARPUS INERMIS, n. sp.

Inermis, glaber, foliis pinnatis, foliolis oblongis obtusis crenatis, floribus copiose racemoso-paniculatis.

A low tree, with thick woody unarmed ultimate branchlets, glabrous in all its parts. Leaves petioled, simply pinnate; blade 6–10 in. long; leaflets about 9, oblong, coriaceous, subsessile, 2–3 in. long, deltoid at the base, obtuse, conspicuously crenate. Racemes very numerous, erecto-patent, arranged in a long panicle with a whorl at the end; pedicels short, square, articulated at the apex, subtended by a minute deltoid persistent bract. Ovary globose, 1-celled, 5-ribbed, crowned by the narrow entire calyx-limb. Petals 4, oblong, greenish, $\frac{1}{12}$ in. long. Stamens 4. Berry globose, oblique, $\frac{1}{8}$ in. diam.; style solitary, erect.—*Gerrard* 11! *Baron* 2748! This is an endemic genus, of which we do not possess the type species (*C. aculeatus*, Decaisne & Planch. in Rev. Hort. ser. 4, vol. iii. p. 109), which has never, so far as I am aware, been described in detail.

GASTONIA EMIRNENSIS, n. sp.

Glabra, foliis simpliciter pinnatis foliolis oblongis integris subcoriaceis oppositis petiolulatis, umbellis 6–9-floris pedunculatis in paniculam elongatam dispositis, pedicellis basi articulatis, ovario globoso 10–12-loculari, calycis limbo angustissimo truncato, stylis brevibus clavatis stellatim patulis.

A shrub, glabrous in all its parts. Leaves a foot or more long; leaflets opposite, distinctly stalked, 4–5 in. long, obtuse, deltoid at the base, green on both sides, with parallel erecto-patent indistinct secondary veins. Panicle a foot long, with a stout woody naked subterete axis, numerous lateral scattered umbels on erecto-patent peduncles 1–2 in. long, and a whorl of five at the end; pedicels $\frac{1}{3}$ in. long. Fruit globose, $\frac{1}{4}$ in. in diam., with as many distinct ribs as there are cells. Styles forming a star $\frac{1}{8}$ in. in diam.—*Baron* 2747! Differs from the Mauritian *G. cutispongia*, Lam., by its almost obsolete calyx-limb.

PANAX (§ SPHÆROPANAX) CONFERTIFOLIUM, n. sp.

Glabrum, foliis simpliciter pinnatis petiolatis, foliolis 5–7 oblongis obtusis rigidis petiolulatis, umbellis paucifloris pedunculatis paniculatis supremis verticillatis, pedicellis brevibus tetragonis, fructu globoso 5-loculari stigmatibus brevibus stellatim patulis.

A shrub, glabrous in all its parts, with thick woody branchlets. Leaves crowded, ascending; petiole 1–2 in. long; rhachis $1\frac{1}{2}$–3 in.; leaflets rigid in texture, 1–2 in. long, green on both sides, with faint erecto-patent secondary veins. Panicles shorter than the leaves; end umbels 5 in a whorl; pedicels $\frac{1}{12}$–$\frac{1}{6}$ in. long, articulated at the base. Ovary globose, $\frac{1}{6}$ in. long and broad; calyx-limb very narrow, subentire; styles cylindrical, $\frac{1}{3}$ lin. long, curved, spreading.—*Baron* 1905! Near *P. zanthoxyloides*, Baker.

PANAX (§ SPHÆROPANAX) MULTIBRACTEATUM, n. sp.

Glabrum, foliis simpliciter pinnatis, foliis multijugis sessilibus subcoriaceis oblongis acutis crenato-serratis, umbellis 6–8-floris in paniculam elongatam dispositis, pedunculis bracteis multis minutis persistentibus præditis, ovario globoso 5-loculari, stylis subulatis falcatis.

A tree, glabrous in all its parts. Leaves simply pinnate, breaking easily at the articulated nodes; leaflets sessile, multijugate, 3–4 in. long, about an inch broad, acute, subcoriaceous, distantly conspicuously inciso-crenate. Umbels in a long simple panicle, with a whorl at the end; peduncles under an inch long, furnished with several minute deltoid green bracts; pedicels $\frac{1}{8}$ in. long. Ovary globose, 5-celled; disk conical beyond the rudimentary calyx-limb; styles cylindrical, reflexed, $\frac{1}{2}$ line long.—*Baron* 2469!

PANAX (§ SPHÆROPANAX) AMPLIFOLIUM, n. sp.

Glabrum, foliis magnis deltoideis bipinnatis, foliolis integris oblongis acutis subcoriaceis, umbellis 6–8-floris copiose paniculatis superioribus verticillatis, pedicellis flore longioribus, calycis tubo campanulato, limbo angustissimo truncato, ovario 4–5-loculari.

A tree, glabrous in all its parts. Fully-developed leaves bipinnate, with a blade a foot long and broad and a petiole $\frac{1}{2}$ ft. long; leaflets paucijugate, distant, all distinctly petioled, entire, subcoriaceous, 2–3 in. long, green and glossy above. Umbels copiously panicled, those at the end of the axis several in a whorl; pedicel $\frac{1}{6}$–$\frac{1}{4}$ in. Calyx with a campanulate tube $\frac{1}{16}$ in. diam., and a narrow truncate limb. Bud green, globose. Petals and stamens 5. Ovary 4–5-celled. Berry not seen.—*Baron* 3233!

PANAX (§ SPHÆROPANAX) PENTAMERUM, n. sp.

Glabrum, ramulis crassis, foliis longe petiolatis deltoideis bipinnatis, foliis ovatis integris acutis paucijugis subcoriaceis, umbellis 4–6-floris paniculatis supremis verticillatis, pedicellis brevibus, fructu globoso pentagono 5-loculari angulis acutis, stylis brevibus cylindricis stellatim patulis.

A tree, with thick woody terete branchlets, glabrous in all its parts. Petiole 3–4 in. long; blade deltoid, and bipinnate in the fully-developed lower leaves, 6–9 in. broad; pinnæ and leaflets paucijugate, the latter stalked, ovate, acute, entire, 2–3 in. long, firm in texture, green on both surfaces. Umbels peduncled, panicled, those at the tip of the axis copiously whorled; pedicels $\frac{1}{8}$ in. long. Fruit globose, 5-celled, $\frac{1}{6}$ in. diam., with 5 strong angles; stigma $\frac{1}{8}$ in. diam., with 5 patent cylindrical branches. Petals not seen.—*Baron* 2555! 2719!

MELANOPHYLLA, genus novum Cornacearum.

Flores hermaphroditi. Ovarium inferum oblongum 2- rarius 3-loculare, ovulis in loculo solitariis ab apice pendulis; calycis limbo brevi minuto dentato; stylis 2–3 sursum facie applanatis. Petala 5 oblonga imbricata decidua. Stamina 5 epigyna petalis breviora, filamentis filiformibus, antheris magnis oblongis subbasifixis. Fructus ignotus.—Frutices vel arbores Madagascarienses, foliis alternis exstipulatis petiolatis oblongis integris vel serratis, floribus parvis racemosis vel racemoso-paniculatis, pedicellis basi bracteatis, apice sæpe bibracteolatis, floribus foliisque siccitate nigrescentibus.

Habit of *Psychotria*, but the leaves are alternate and exstipulate. The fruit is unknown. There is one species represented by two numbers in Mr. Baron's last collection; another was gathered by Mr. L. Kitching; and there are two in Humblot's collection from the north-east of the island, Nos. 437 and 517,—in all four distinct species.

M. ALNIFOLIA, *Baker*, n. sp.; foliis obovatis apice solum serratis, floribus simpliciter racemosis, calycis limbo dentibus deltoideis.

An erect much-branched shrub or tree, glabrous in all its parts. Leaves alternate, turning black when dried; petiole $\frac{1}{2}$–$\frac{3}{4}$ in., articulated and dilated to clasp the stem at the base; blade obovate, obtuse, 2–3 in. long, deltoid at the base, moderately firm in texture, inciso-crenate towards the apex only, with a few fine erecto-patent main veins. Racemes 1–2nate at the end of the branches, shortly peduncled, 1½–2 in. long; pedicels erecto-patent, ⅛ in. long, with a small persistent deltoid bract at the base, and a pair of small persistent deltoid bracteoles at the apex clasping the ovary. Ovary oblong, $\frac{1}{12}$ in. long. Calyx-limb minute, collar-like, with 5 distinct deltoid teeth. Petals oblong, ⅙ in. long. Filaments as long as the oblong anthers. Stigmas tongue-shaped.—*Baron* 3097! 3240!

M. AUCUBÆFOLIA, *Baker*, n. sp.; foliis longe petiolatis oblongis serratis, floribus copiose racemoso-paniculatis, calycis limbo segmentis brevissimis.

A shrub or tree, glabrous in all its parts. Branchlets stouter than in the other species, with pale drab bark marked with close fine transverse ridges. Leaves alternate, turning blackish when dried; petiole 2–3 in. long, much dilated, amplexicaul and articulated at the base; blade oblong, obtuse, 5–6 in. long, distinctly serrated except towards the deltoid base, moderately firm in texture, with fine distant erecto-patent main veins. Racemes erecto-patent, forming a deltoid peduncled end-panicle; pedicels very short, with a persistent deltoid bract at the base. Ovary oblong, not clasped at the base by a pair of bracteoles; limb short and collar-like, obscurely toothed. Reflexing petals ⅛ in. long. Stamens shorter than the petals.—Between Tamatave and Antananarivo, *L. Kitching*!

Observations on a singular Mode of Development in the Lady-Fern (*Athyrium Filix-fœmina*). By CHARLES T. DRUERY. (Communicated by Dr. J. MURIE, F.L.S.)

[Read 19th June, 1884.]

THE reproduction of the Filices by their spores results from sexual action taking place upon the under surface of the prothallus to which the spore gives rise. So far, I believe, no development of the perfect prothallus has been observed without the agency of the spore, and the following record of such a case therefore deserves special notice.

Some years ago a very distinct and beautiful form of *Athyrium Filix-fœmina* was found wild by Mr. Moule in North Devon, from whose possession it passed into that of Col. Jones, of Clifton. Many attempts were made at the time to propagate it from what were assumed to be spores, always, however, without success; and at length it was taken for granted that the peculiar growths produced by this Fern in the place of sori were merely abortive spore-cases, and that the plants, like some other abnormal forms, lacked the special vigour necessary for the formation of perfect reproductive spores. All further attempts at raising it were consequently abandoned; and only two divisions of the plant exist *. In the autumn of 1883 I discovered upon another *Athyrium* (*A. F.-f.*, var. *plumosum divaricatum*) numerous proliferous bulbils occupying the place of sori on the back of the fronds; and, reporting this to Mr. G. B. Wollaston, he was led to re-examine *A. F.-f. clarissima*, as the Fern in question had been named by Col. Jones, and came to the conclusion that these so far barren excrescences might be viviparous growths of a kindred nature, and capable of reproducing the parent form by direct bud-development. A portion of a frond was consequently sent to me, and upon examining it under the microscope I found that there were very material structural differences between the unmistakable bulbils of *A. F.-f. divaricatum* and the singular growths upon *A. F.-f. clarissima*, the former being solitary bud-like growths seated in the centre of a number of brown lanceolate scales and without a trace of indusium; while the latter were composed of 5 or 6 or more flask-shaped bodies, each one larger than the bulbils aforesaid, and seated within an undoubted indusium. The masses were sufficiently large for their formation to be clearly distinguishable by the naked eye, covering more than the space of an ordinary sorus. At this stage no signs of spores or spore-cases could be detected, nor could any axis of growth be perceived; so that it was impossible to form any theory as to the eventual mode of reproduction which might result; for although the tips of the flask-shaped pseudobulbils were in some cases elongated into filiform processes, no sign of circination or resemblance to fronds was visible, added to which the presence of an indusium in the place of the scales common to true bulbils led to the assumption that they were abnormal sporoid growths, and not proliferous ones likely to produce plants by direct bud-growth.

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* It is, of course, open to question whether the excrescences formed prior to 1883 were of exactly the same nature. Col. Jones inclines to the belief that they approached more nearly the character of sori, and did not in previous years present the same appearance as now described.

To test their capabilities I laid down on Nov. 27, in a duly prepared seed-pan, numerous pinnæ, which I imbedded edgewise halfway in the soil, the growths being thus brought into immediate contact with it, lying as they did along the rhachides of the pinnæ. I then placed the pan in slight heat, with the result that the pseudobulbils immediately began to increase in size and to develop in such a fashion, that on Dec. 24 I was able to record an evident foliaceous extension and division of the tips of the pseudobulbils, and the appearance of numerous long rigid glassy-looking rods or hairs which sprang from their bases. These rods bore a strong resemblance to the root-hairs common to the undersides of prothalli; but their decided upward growth, radiating stiffly, seemed opposed to this view, as also the fact that they sprang from the bases and sides of the pseudobulbils. It is probable, however, that they acted as aerial roots, for the growth of the tips of the pseudobulbils proceeded rapidly, until, on Feb. 10 of the present year, I recorded that they had assumed a decided prothalloid form, while the upright rods had either become deflected or absorbed. Eventually all the tips of the flask-shaped bulbils assumed the form of perfect prothalli of the usual size and shape, the pseudobulbils themselves being absorbed and disappearing, and the usual root-hairs developing under the prothalli. On March 17 several of these prothalli were examined microscopically, both by myself and by the Rev. Mr. Aubrey, of Salisbury (to whom I am indebted for aid in observing the final stages of growth), and well-developed archegonia were found in the usual place and number, but so far neither of us was able to detect antheridia. Early in May, however, I succeeded in finding a single antheridium; and it is manifest that many others must have been present on the prothalli not examined, as on May 21 the final stage was reached. Small fronds being visible in several cases, projecting from the bifurcation of the prothallus, and evidently therefore produced from the archegonia by the ordinary sexual mode of reproduction; though the prothalli, as has been shown, had developed from growths that differed widely from spores in their form, their size, persistent adherence to the pinnæ, their production of root-hairs from their surface, and, finally, the development of the prothallus from their apices by simple extension of growth.

Lest it might be assumed that these prothalli may after all have resulted from true spores scattered amongst the excrescences described, it should be borne in mind, first, that no spores or spore-cases could be distinguished when the pinnæ were laid down; secondly, that all attempts to raise this Fern from spores have failed; and finally, that the entire development of the prothallus from the pointed tip of the pear-shaped pseudobulb—its dilation, bifurcation, and gradual assumption of the true prothallus-form—has been carefully watched and noted step by step, not merely in one case, but in many, in all of which the prothallus was evolved in the same way precisely.

Where, as in this case, the whole phenomenon is new to the observer, many points of interest are apt to be overlooked, their importance being unknown until too late. Another season's growth may therefore confidently be expected to throw more light upon this development, and especially in relation to the first appearance of the pseudobulbils themselves, which only came under close observation when already of considerable size.

In framing this account of the occurrence, I have confined myself as strictly as possible to a simple and, I hope, clear record of the phenomena observed during the various stages of growth of the abnormal sporoid excrescences under observation. In conclusion, however, I may be permitted to point out, in connection with such phenomena that, so far as formal records are concerned, the family of *Athyria* has hitherto been remarkable for the nonproliferous character of the fronds, which, considering, first, its near relation to the *Asplenia*, so many of which are profusely proliferous, and, secondly, the protean nature of the family itself, is a singular fact. The discovery, however, of numerous proliferous buds which appeared upon some very small plants, which I exhibited here in 1882, led me to institute further inquiries into this subject. I then ascertained that Mr. Mapplebeck had already observed the same phenomenon, and raised plants from similar bulbils, which appeared identical in position and character with those of the *Asplenia*. Last year, as already remarked, I found another and very distinct form of proliferation on a mature plant of *A. F.-f. plumosum divaricatum*, upon which numerous bulbils were evolved in the place of the sori; this, be it observed, being on the underside of the pinnæ, a most unlikely place for such growths. This same transformation of the reproductive energy had already been observed on three other kindred forms of *Athyrium*, upon one of which the bulbils and sori were scattered almost indiscriminately over the back of the fronds, some of the sori seeming to be in an intermediate amorphous condition; though in all other cases, so far as I could see, the sori and bulbils were distinctly differentiated by the presence in the former case of an indusium, and in the latter of lanceolate scales arranged shuttlecock fashion around the bulbil, no trace of indusium existing. Such bulbils had, until this season, failed invariably to yield plants, and seemed incapable of forming a proper axis of growth. Mr. G. B. Wollaston has, however, succeeded in obtaining plants this spring from *A. F.-f. plumosum elegans*, and one or two of those from *A. F.-f. plumosum divaricatum* have developed fresh fronds with me.

From this it will be seen that no less than three distinct forms of proliferation have now been observed on the *Athyria*.

1. Bulbils of the ordinary character developed in the axils and on the superior surface of the pinnæ, and agreeing in character with the ordinary bulbils of the *Asplenia*.

2. Bulbils formed apparently by transmuted spore-producing energy and occupying the place of sori, *i. e.* on the underside of the pinnæ—a position so far, I believe, quite unrecorded in connection with any of the Filices.

3. A new form of proliferation altogether, viz. proliferous prothalli arising from pseudobulbils produced by a different transmutation of the reproductive force, and evolving plants only after the prothalli have produced the usual sexual organs common to prothalli resulting from spores.

Further Notes on a singular Mode of Reproduction in *Athyrium Filix-fœmina*, var. *clarissima*. By Charles T. Druery. (Communicated by Dr. J. Murie, F.L.S.)

[Read 20th November, 1884.]

At a meeting of the Linnean Society in June last I had the honour of bringing before your notice a record of certain phenomena which I had observed during the past winter in connection with the reproduction of a form of *Athyrium Filix-fœmina* through prothalli, which were not produced from spores but from certain excrescences evolved in their stead upon the under surface of the pinnæ. The *Athyrium* in question, which was found wild in Devon, had been for many years reputed barren, the fructification which appeared copiously yielding no perfect spores, the result being that after a long period only two plants existed, the original plant having permitted but one division. In 1883 one of these plants, which had been grown under cover, was observed to produce upon the inferior surface of the pinnæ a large number of curious excrescences consisting of pear-shaped bulbilloid growths, attached firmly to the frond by their thicker extremities, and seated in every case within indusia, thus occupying the place of sporangia, to which, however, they bore no resemblance whatever. Mr. G. B. Wollaston, whose attention was drawn to them by the previous discovery of bulbils proper upon other *Athyria* in the same year, which bulbils also occupied the place of sori, was of opinion that they were also bulbils. However, on comparing them with the bulbils produced on these other *Athyria*, I was struck by the fact that, while in the other cases the bulbils were seated in the centre of scales arranged shuttlecock fashion around them, in this case indusia were present

Fig. 1.

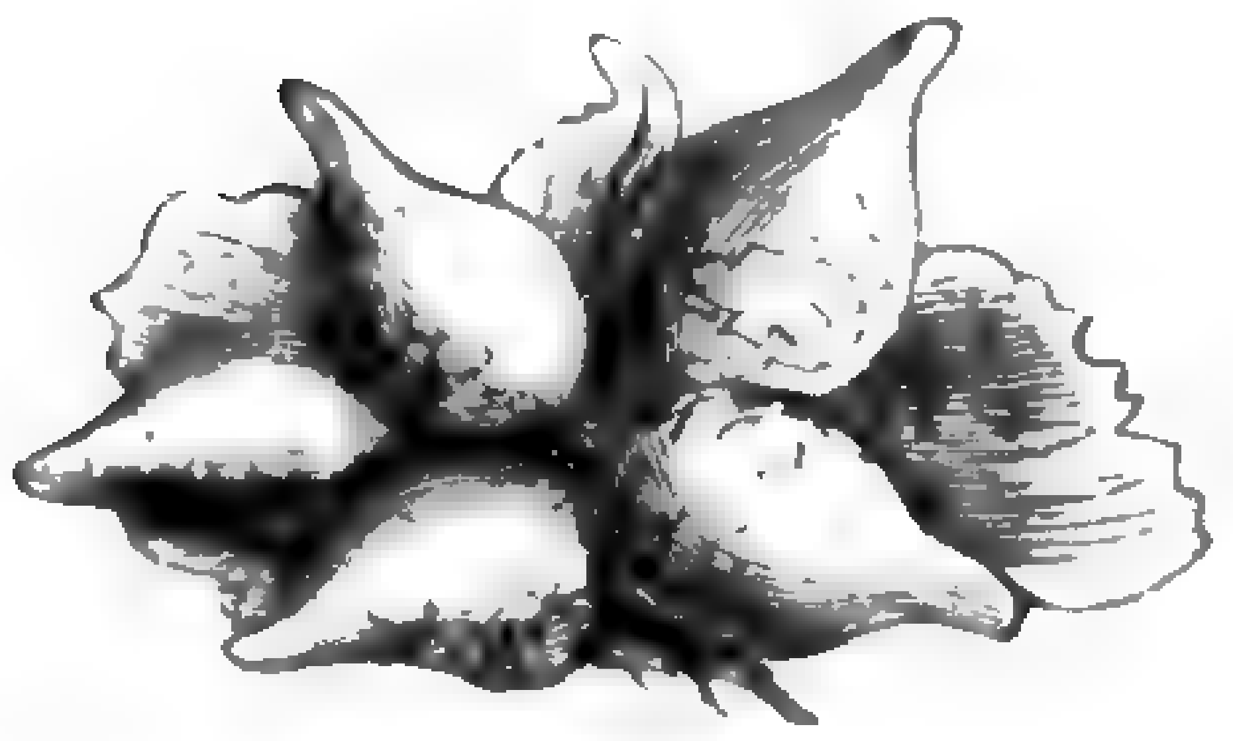

Fig. 2.

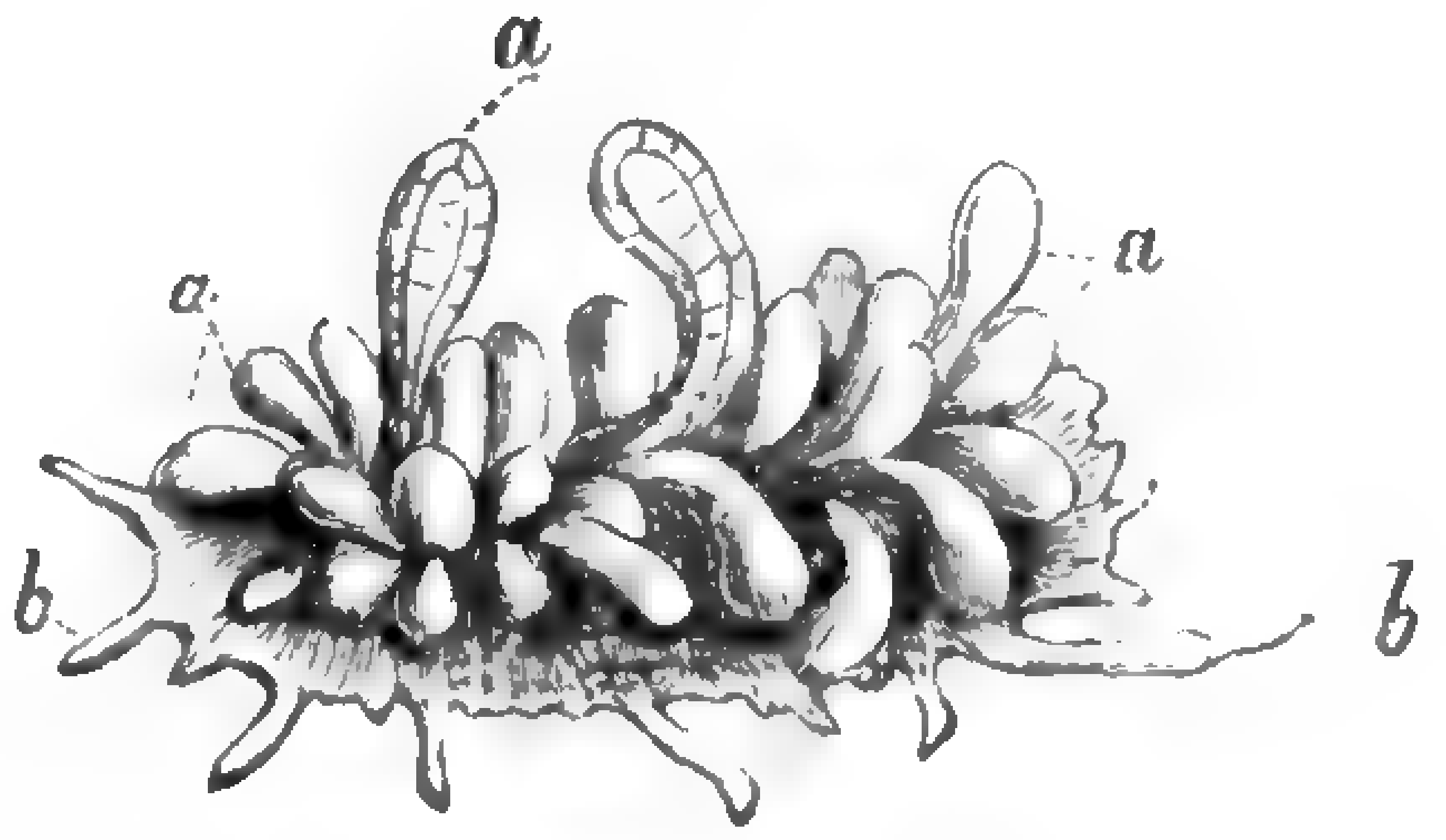

Fig. 1. Pyriform pseudobulbils or abnormal sporoid growths of 1883, enlarged.
Fig. 2. *a*, clavate abnormal sporoid growths of 1884; *b*, ragged indusium.

instead, which led me to look upon them as sporoid growths of a character essentially different from the bulbils common to many Ferns. I consequently laid down a number of pinnæ, with the result that I read before you in June, viz. the production of perfect prothalli by the bifurcation of the points of the pear-shaped pseudobulbils, which prothalli eventually developed archegonia and antheridia, and finally yielded plants of the same type as the parent.

At the meeting in June I could do no more than lay the consecutive record of my observations before you, since all traces of the preliminary stages had vanished when the young plants appeared, and these were then too diminutive for their character to be determined; they also afforded no evidence whatever that they had originated in other than the usual way, viz. from spores, and I consequently did not exhibit them.

To-night, however, I have pleasure in exhibiting some of the plants produced as I have described. I had hoped, too, to be able to bring pinnæ bearing pseudobulbils as described and sketched by me last year; but owing, partly, I believe, to the long dry summer, and partly to the fact that the parent plant (which is not under my control) was placed out of doors for a time, I am only able to produce pinnæ showing the fructification in a very immature state—not so immature, however, but that they afford ample evidence of abnormality.

To any one accustomed to deal with *Athyrium Filix-fœmina*, the first glance will strike one with surprise at the presence of fresh green unripe fructification with, in most cases, unlifted indusia upon a deciduous fern in November, months after the time when sporangia proper have ripened and scattered their spores, and when the indusia are usually in a ruinous and fragmentary state. Here and there the indusia on the pinnæ exhibited will be seen to be lifted and to partially disclose a number of curious club-shaped and occasionally serpentine cellular masses which, though very different from the swollen pear-shaped bodies of last year, differ as widely from embryo sori, showing no signs whatever of annulation or of the symmetry which would characterize immature sporangia when sufficiently advanced to protrude from the indusium. While, however, the pear-shaped pseudobulbils are conspicuous by their absence, it will be seen that some of the club-shaped excrescences are larger than others. From their general appearance, I believe that, given a more favourable season, some few would assume predominance and form the pear-shaped pseudobulbils at the expense of the weaker growths, which would abort, as in many analogous cases. I incline the more strongly to this opinion, as among the bases of the pear-shaped bodies produced last year there were numerous thin, thready, and shapeless growths, exactly such as would be likely to originate in such a way.

My present object being to confirm as far as possible the data I gave in June, I would call your attention, first, to the existence of the young plants upon the table, raised as described; and, secondly, to the manifestly non-soriferous form of fructification borne by the parent plant, an examination of which will, I think, go far to convince you that its offspring are engendered neither through spores nor by bulbils, but by some other mode of reproduction—a mode which, from constant and careful watching through all its stages, I believe to be one so far unrecorded in connection with any other Fern, viz., through prothalli produced, not from spores, but by direct bud-growth from the parent frond.

On Apospory in Ferns (with special reference to Mr. Charles T. Druery's Observations). By F. O. Bower, M.A., F.L.S.

[Read 18th December, 1884.]

(Plates XI. & XII.)

Mr. C. T. Druery has already drawn the attention of the Society in two successive papers to *Athyrium Filix-fœmina*, var. *clarissima*, ascribing to that plant a mode of transition from the sporophore generation (or Fern-plant), to the oophore (or prothallus), without the intervention of spores. He has pursued the subject with success, as far as it is possible without subjecting the matter to a detailed microscopical investigation. We are indebted to this observer not only for the communications already received from him, but also for his generosity in supplying to the Royal Gardens at Kew material fitted for the more detailed microscopical analysis of the process. Without further recapitulation of Mr. Druery's results, I may at once proceed briefly to describe the observations which I have made on the cultures now in progress at Kew. Many minute details will be deferred for the present till the investigation is completed; the chief results are, however, of such importance as to justify a preliminary notice of them.

The sori in *Athyrium Filix-fœmina*, var. *clarissima*, appear in the normal position with a normal indusium. In the condition in which the specimens were when first I received them (Nov. 29), the large majority of the sporangia presented an abnormal appearance. Some few appeared of nearly normal structure, with an annulus, but were arrested at a point of development before the formation of the spores (Plate XI. fig. 1); others, and indeed the majority of them, showed more or less distinctly the central *archespore*, together with the cells which would normally form the wall of the sporangium; but there the normal development seemed to have been suddenly arrested—the archespore had not in these cases divided further to form either the tapetum or the mother-cells of the spores (Plate XI. fig. 2). The arrest of development of the archespore is, however, compensated in these cases by the more active vegetative development of the stalk of the sporangium and of the superficial cells of the head; the result being that the arrested sporangium ultimately appears as a club-shaped body of larger size than the normal sporangium. The individual cells also are of larger size; they contain numerous chlorophyll-granules which, if present at all in normal sporangia, are relatively few in number. Further, the more rudimentary the head of the sporangium is, the more marked is the vegetative development of the remaining parts.

If pinnules showing the above characters be subjected to favourable conditions of heat and moisture, the vegetative development of the sporangia may proceed at once. On pinnules laid on damp soil, and forced quickly in the propagating-pits at Kew, the earlier stages of this further development have been traced. The details show great irregularity; and they are found to correspond to the greater or less completeness of arrest in the normal development of the sporangium. Thus sporangia which show a clearly marked annulus do not usually assume any further vegetative activity; those, however, which are arrested at an earlier stage in their normal development may produce, by a purely vegetative process, outgrowths of very irregular form. Sometimes all the superficial cells of the club-shaped body may take part in the process, and this is most clearly seen where the arrest of the normal development is most complete (Plate XI. figs. 3, 5, 6). In other cases the head of the arrested sporangium may be thrown off, while the stalk continues its vegetative growth (Plate XI. fig. 3). The result is in either case the formation of flattened structures, consisting only of parenchymatous, chlorophyll-containing cells, which, sooner or later, show at one or more points on their margins that growth with a wedge-shaped apical cell which is well known as characteristic of the Fern prothallus; root-hairs are at the same time formed by the outgrowth of individual cells (Plate XI. figs. 6, 7). None of my cultures have as yet formed sexual organs: this we must wait for; but meanwhile it may be remarked that Mr. Druery's observations during the last two years show that, in the cases observed by him, sexual organs were formed, and young Fern-plants were produced by them. In any case, however, the above observations show that in the Fern in question there is a transition from the sporophore generation to a structure of a prothalloid nature, without the intervention of spores, and that it is formed by a process of purely vegetative growth from more or less reduced sporangia. Finally, it may be stated that my observations do not exclude the possibility of a formation of such structures by a vegetative outgrowth of the base of the sorus itself; whether this actually occurs must be decided by further investigation *.

Through Mr. Druery I have Mr. G. B. Wollaston's permission to mention a still more interesting example of apospory, of which the latter gentleman is the discoverer, viz. *Polystichum angulare*, var. *pulcherrimum*. Here flattened organs, of undoubted prothalloid nature, are formed by simple vegetative outgrowth of the tips of the pinnules, and without any connection with sori or sporangia. At first the tip of the pinnule merely extends, so as to form a flattened expansion, one layer of cells in thickness, and with a very irregular margin; while the whole tip curves downwards, and often forms a spiral coil of one, or one and a half turns, closely covered above by the more expanded portion of the pinnule. In other cases the outgrowth may assume very irregular forms. Ultimately the characteristic marginal growth begins at some point, sometimes terminal, but more frequently lateral. The details of this development have not yet been fully investigated. The result, however, is the formation of a flattened, often heart-shaped expansion, with a thickened cushion similar in structure to that found in normal prothalli; it bears antheridia and archegonia of normal structure; sometimes, as occurs also in ordinary prothalli, they are found both on the lower and upper surfaces.

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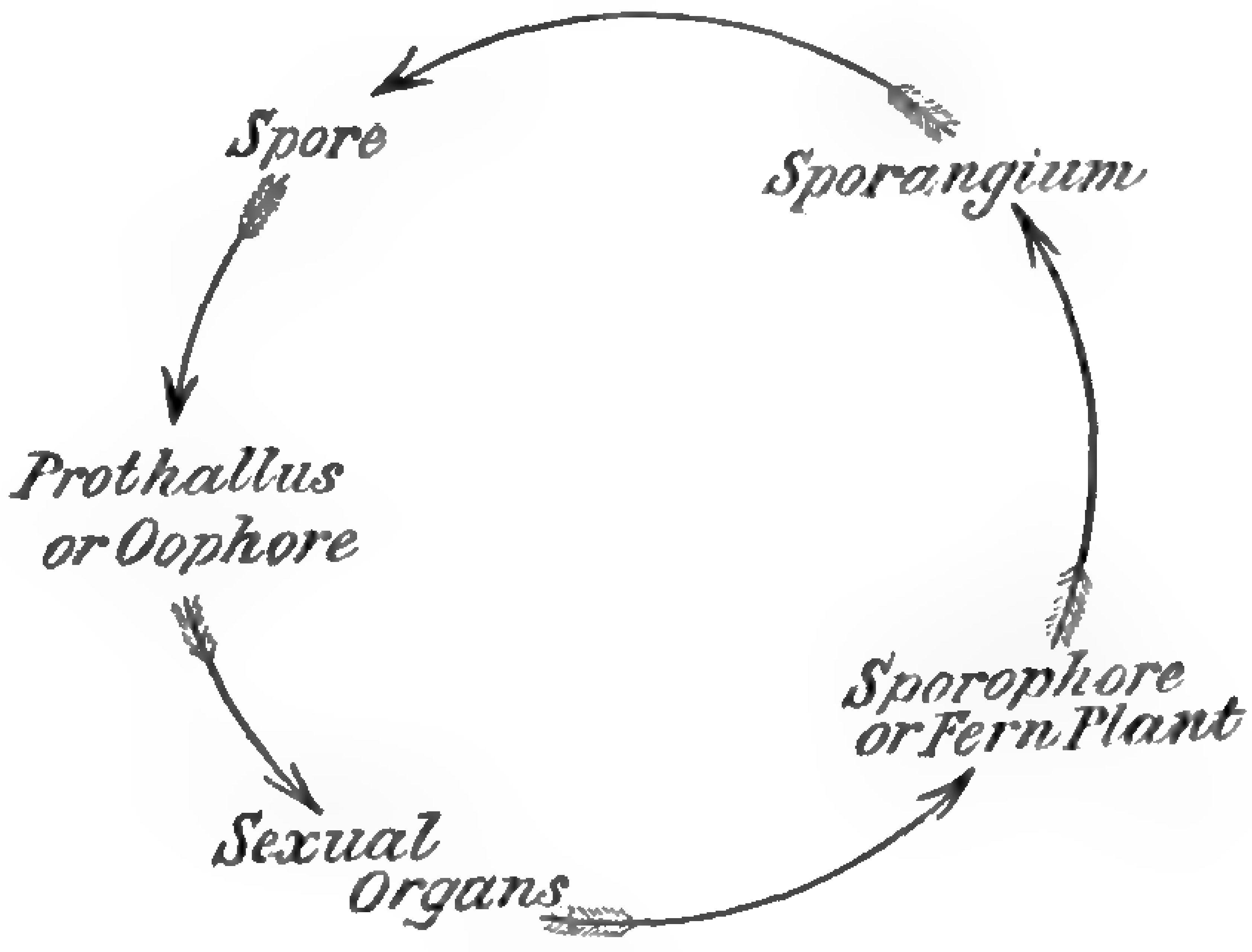
* Since the above was written the cultures at Kew have progressed so that prothalli bearing archegonia and antheridia may be seen, still connected at their bases with the pinnule of the parent plant (Pl. XII. fig. 8).—Feb. 11, 1885.

A point worthy of note is, that in those prothalloid structures which are taken directly from living leaves in the normal position without further cultivation, the antheridia and archegonia have not opened; no doubt this is due to the want of water, which, as is well known, is necessary for this process. I have not yet been able to observe the formation of young Fern-plants on these prothalli; but it may be hoped that from cultures now in progress at Kew and elsewhere further evidence may be obtained on this point.

This *Polystichum* is thus an example of the formation of an expansion of *undoubted prothalloid nature*, bearing sexual organs by a process of purely vegetative outgrowth from the Fern-plant; that is, there is a transition in this case from the sporophore generation to the oophore by a vegetative growth, and without any connection either with spores or, indeed, with sporangia or sori. It may be regarded as a still more complete example of *apospory* than that of *Athyrium Filix-fœmina*, var. *clarissima*.

It remains to point out the bearing of these observations upon the general life-history of the Fern. The normal cycle of life of these plants may be represented graphically thus:—

Diag. 1.



We already know various modifications of this simple cycle, which may be classified under two heads:—

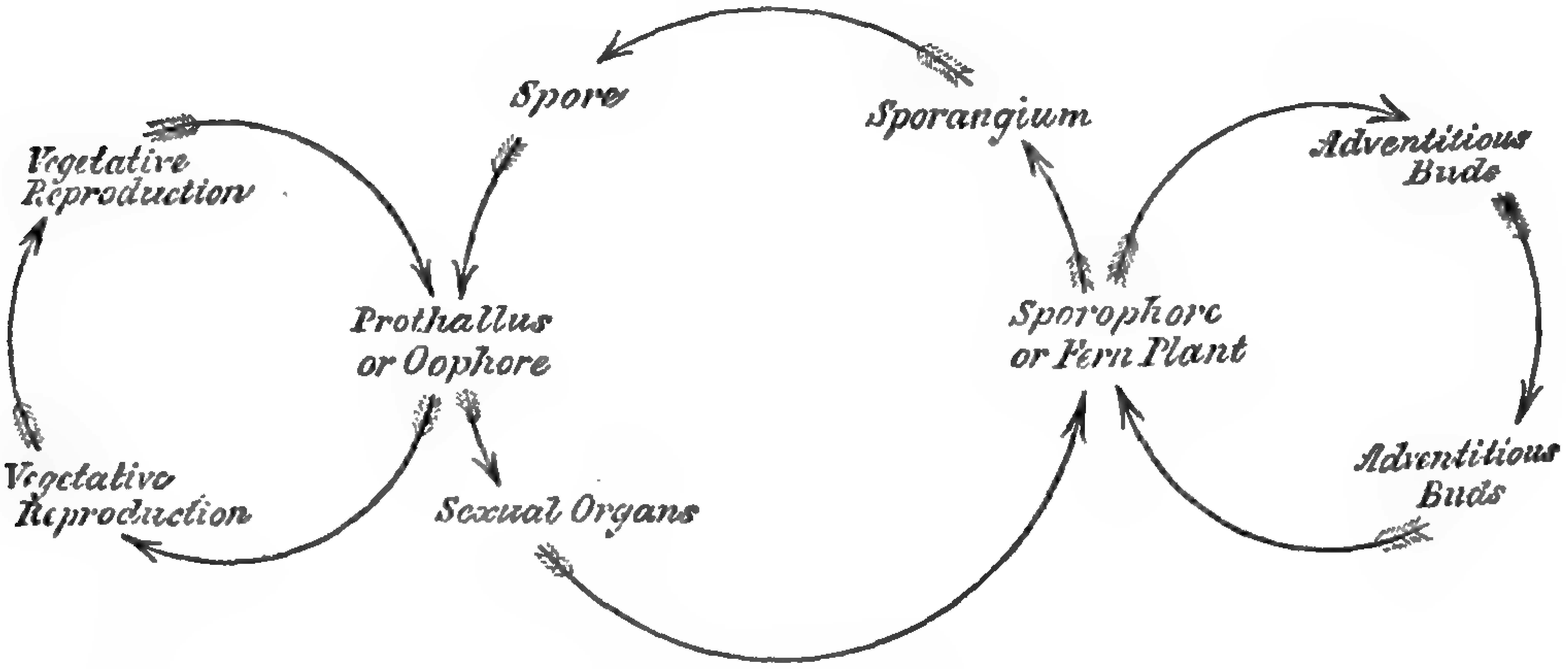
1. Modifications which lengthen the cycle.

2. Those which reduce it, and may therefore be regarded as short cuts.

Taking first those of the first category, they may be described as modes of vegetative reproduction, by which one generation or the other simply reproduces itself. Thus the sporophore, or Fern-plant, may form adventitious buds, which are found seated at various points on the leaves; these may be ultimately separated from the parent plant as new individuals of the sporophore generation: as examples may be cited various species of *Asplenium.* In the case of the prothallus or oophore generation, a vegetative mode of reproduction by adventitious buds, resulting in the formation of fresh prothalli, has been observed in numerous cases, e. g. *Osmunda*, *Gymnogramme leptophylla*, &c.*; and more especially in that form of prothallus described by Cramer, but not identified with certainty: here special *gemmæ* carried on the process of vegetative reproduction of the prothallus †.

Thus in each of the alternating generations of the Fern the cycle is liable in certain cases to be extended by processes of vegetative reproduction; this may be represented graphically, as in the subjoined diagram:—

Diag. 2.



Taking now into consideration those modifications of the life-history by which the cycle may be reduced, we may find two points at which a short cut may be taken:—there may be a transition from the prothallus to the Fern-plant without the intervention of sexual organs; secondly, there may be a direct transition from the Fern-plant to the prothallus without the intervention of spores.

The former of these short cuts has already been observed: first by Farlow, in *Pteris cretica*; and it has been described at length by De Bary ‡ in this plant, and also in other Ferns (*Aspi-*

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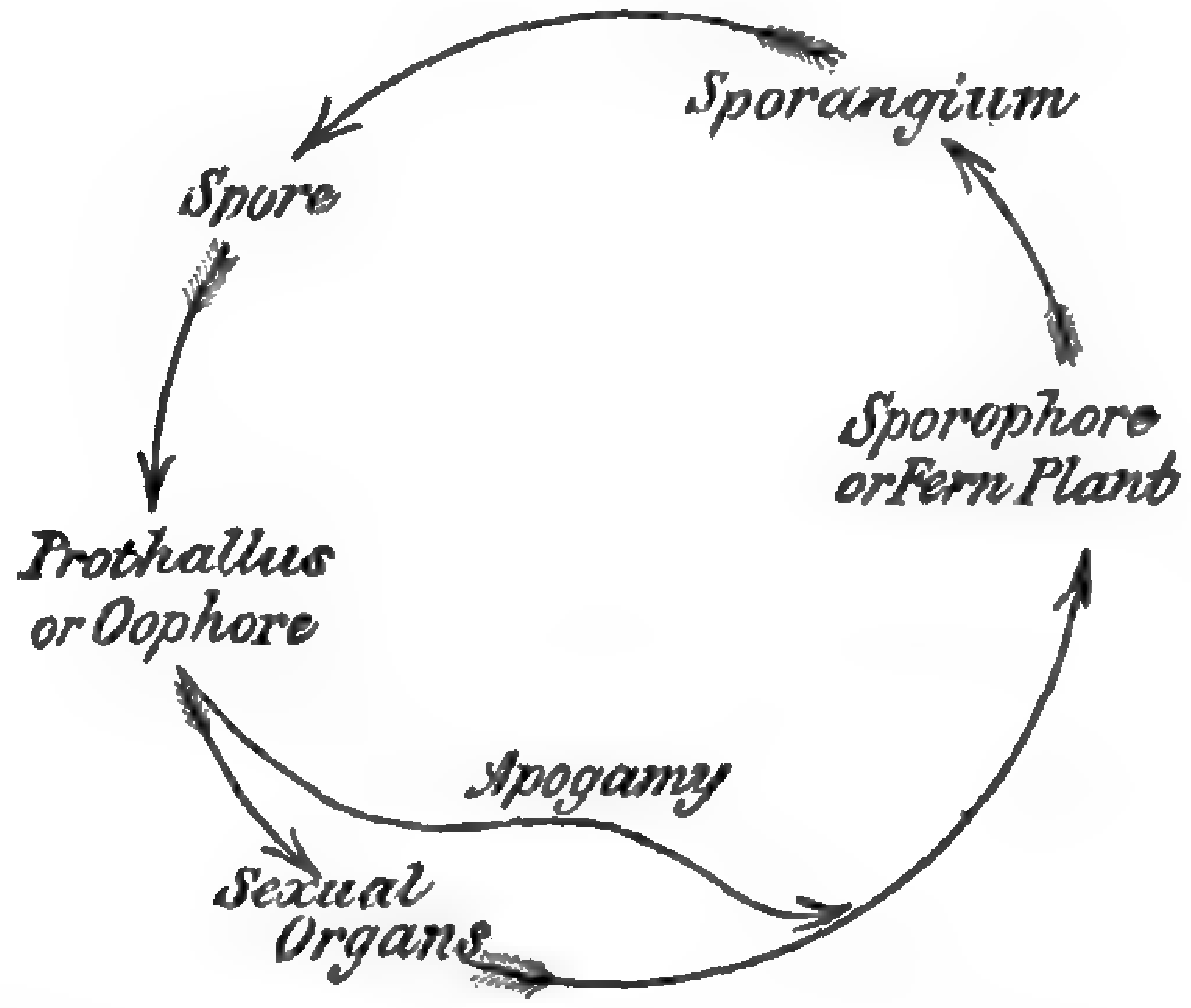
* Goebel, "Entw. des Prothalliums von *Gymnogramme leptophylla*," Bot. Zeit. 1877; also Goebel, 'Grundzüge der Systematik,' p. 221.

† Cramer, "Ueber die geschlechtlose Vermehrung des Farnprothalliums," Sep.-Abdr. Denkschr. d. Schweitz. naturforsch. Gesellsch. Bd. xxviii., 1880.

‡ Farlow, Quart. Journ. Micr. Sci. 1874, p. 266; De Bary, Bot. Zeit. 1878, p. 449.

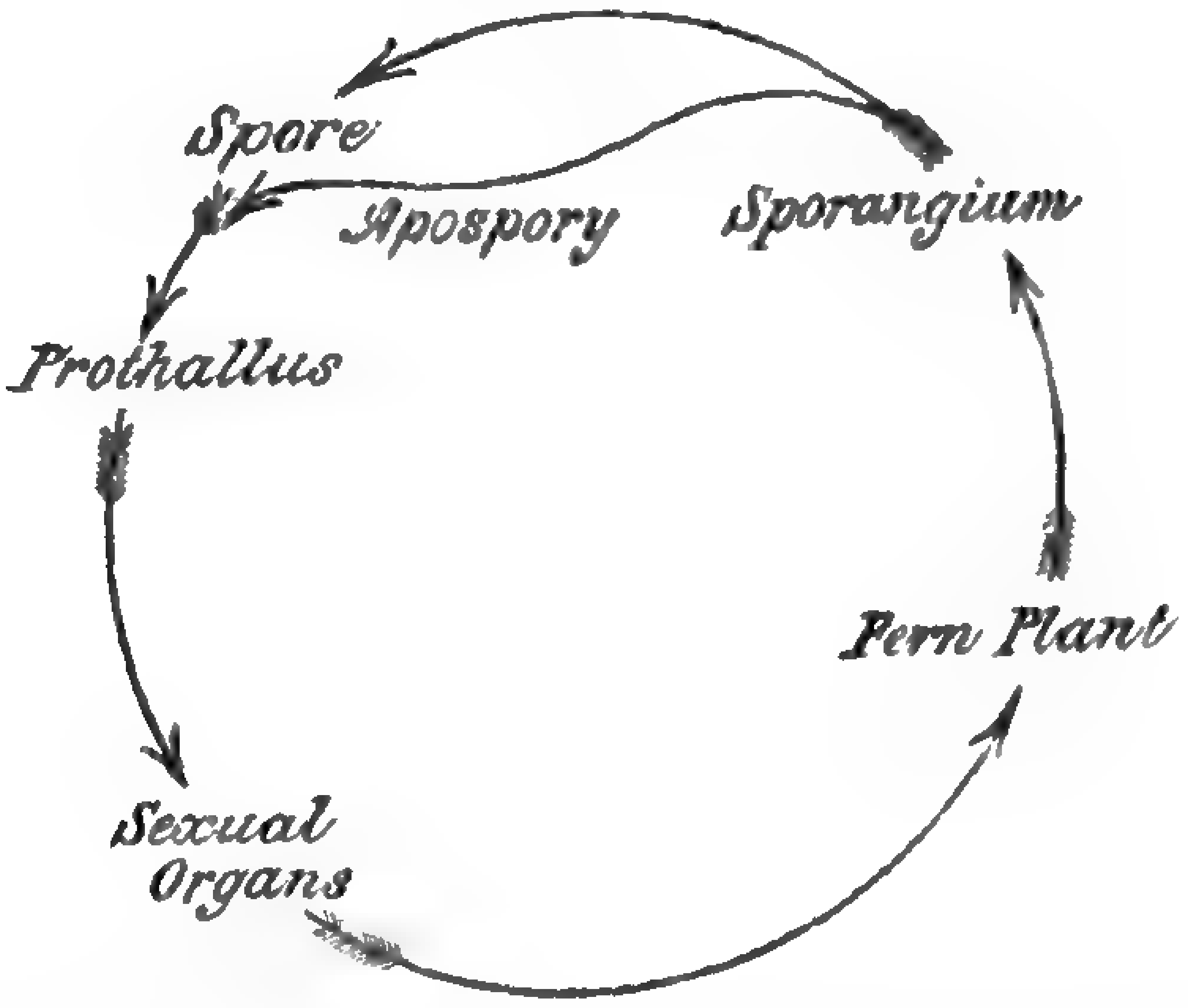
dium Filix-mas, var. *cristatum*, *Aspidium falcatum*); and by Sadebeck * in *Todea africana*. The phenomenon now passes under the name of *apogamy*. The prothalli in the cases named produce either constantly or frequently, by direct budding, new Fern-plants, without the sexual organs (which may or may not be developed) taking any direct part in their origin. This may be represented graphically thus:—

Diag. 3.


Sporangium
Spore
Sporophore or Fern Plant
Prothallus or Oophore
Apogamy
Sexual Organs

Till Mr. Druery communicated his two papers to this Society, no observations bearing upon the converse case, viz. that of the excision of the spore from the cycle of life of the Fern, had been published, though the phenomenon had been artificially induced in certain Mosses. We now see in the case of *Athyrium Filix-fœmina*, var. *clarissima*, that the spores are not developed, but that there is a direct passage by a purely vegetative growth from the sporophore generation to the oophore; and that in this plant the prothallus originates, as a rule, from the arrested sporangium. This may be graphically represented thus:—

Diag. 4.


Spore
Apospory
Sporangium
Prothallus
Fern Plant
Sexual Organs

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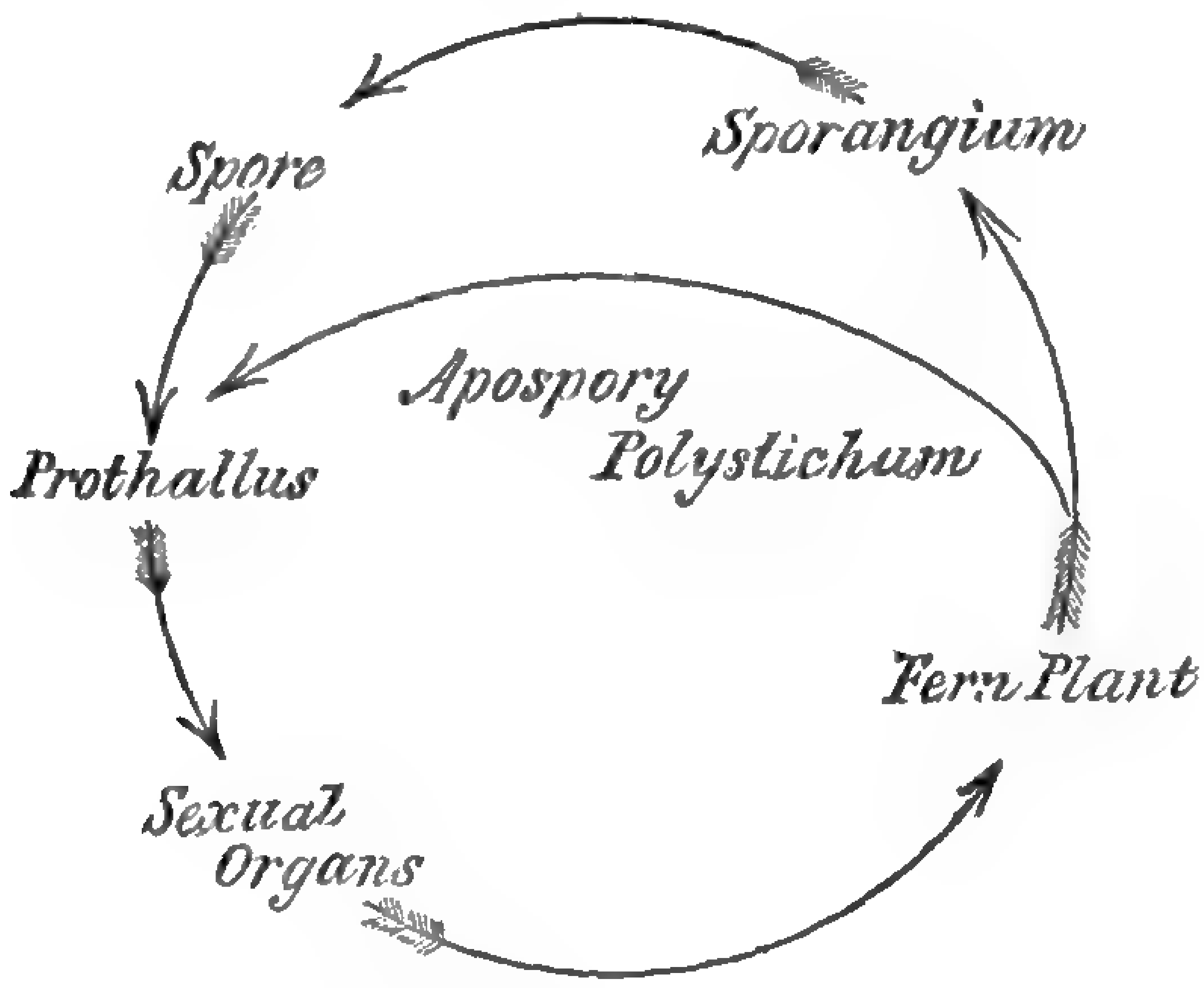
* Schenk's 'Handbuch,' Bd. i. p. 234.

In the case of *Polystichum angulare*, var. *pulcherrimum*, there is a more extensive excision from the cycle. Here not only is the formation of the prothallus independent of the formation of spores, but it even originates quite apart from the sporangium and sorus by a purely vegetative outgrowth of the tips of the pinnules; this may be represented graphically thus:—

Diag. 5.



Lastly, it remains to compare this new phenomenon of *apospory* in the Ferns with similar cases in other plants. In 1876 it was shown by Pringsheim*, and also by Stahl †, that if the stalk of the sporogonium of certain Mosses (*Hypnum cupressiforme*, *Amblystegium serpens*, *Bryum cæspiticium*, *Ceratodon purpureus*) be cut into short pieces and cultivated on damp soil, protonemal filaments spring from single cells, and ultimately produce moss-plants of the normal type. There is thus artificially induced, by the prevention of the formation of spores, a direct transition from the sporophore generation to the oophore by a purely vegetative process. If we discount the artificial character of this phenomenon, it may be closely compared with the examples of apospory in Ferns, above described.

A second example, but one which does not correspond exactly with the above, is that vegetative budding described by Goebel ‡ as occurring in plants of *Isoëtes lacustris* and *I. echinospora*. In these species a bud frequently takes the place of the sporangium, and is seated in the fovea at the base of the leaf. The bud develops as a normal shoot of the sporophore generation. It may be concluded that in this case there is an excision from the cycle not only of the sporangium and spores, but also of the whole oophore generation. This may be represented graphically thus:—

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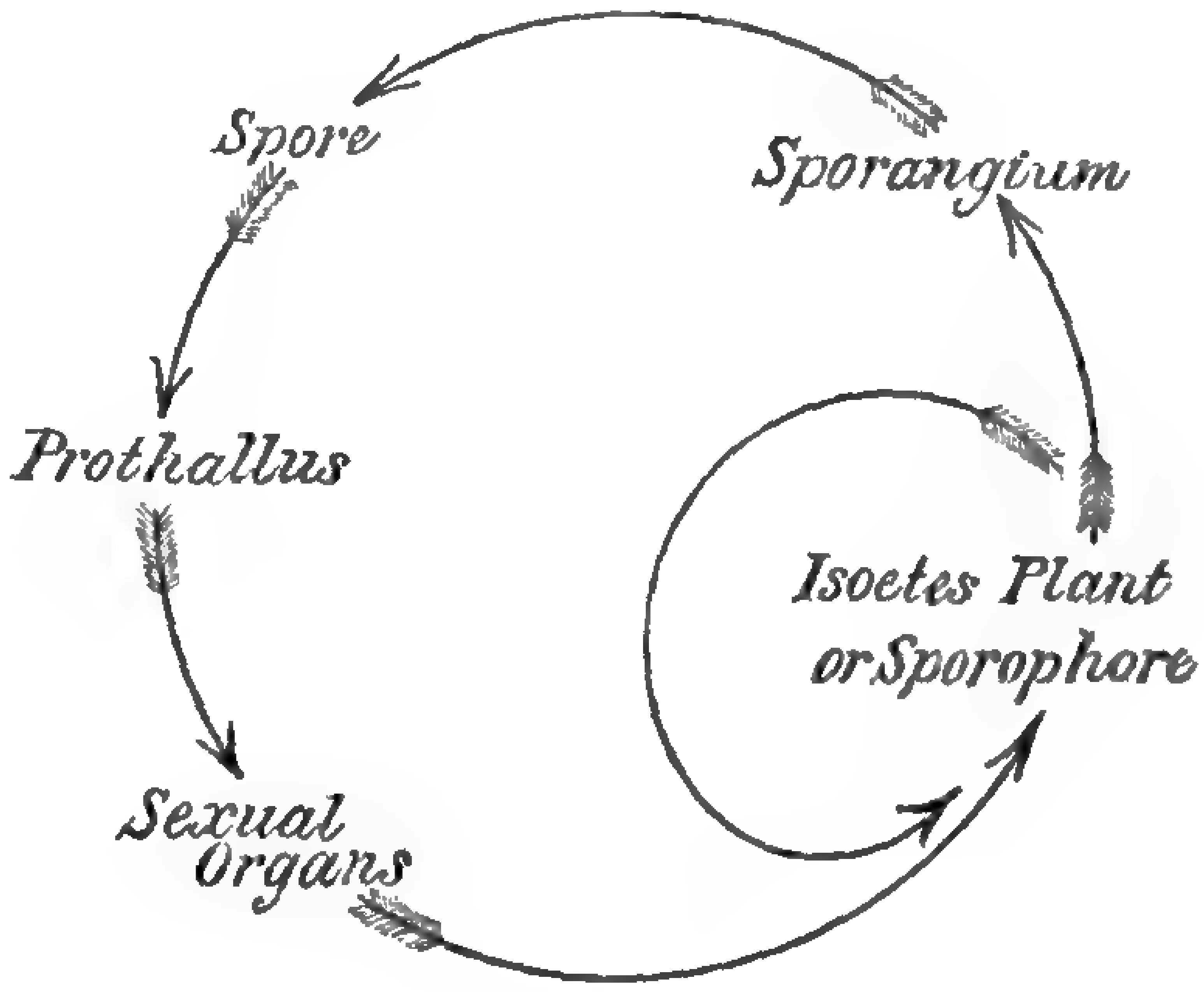
* Monatsber. d. Akad. d. Wiss. in Berlin, 1876.

† Bot. Zeit. 1876, p. 689.

‡ Bot. Zeit. 1879, p. 1.

Diag. 6.



It is clear that in many points this most interesting process of aposporous reproduction in the Ferns requires further investigation. It is confidently hoped that the cultures now progressing in Kew, and in the private collections of Mr. Druery and others, will clear up many uncertain points. It may also be expected that, since attention is now called to the subject, other examples of the same or similar phenomena may be discovered which had hitherto escaped notice.

DESCRIPTION OF THE PLATES.

Plate XI.

Athyrium Filix-fœmina, var. *clarissima*.

Fig. 1. An arrested sporangium with annulus already formed, but the cell-walls not thickened; the cells of the head of the sporangium have almost lost their contents, while those of the stalk (*st*) have abundant protoplasm and chlorophyll-granules. ×325.

Fig. 2. An arrested sporangium, of which the archespore (*a*) has not undergone division The stalk (*st*) is abnormally enlarged, and its cells have abundant protoplasm and chlorophyll. ×325.

Fig. 3. A sporangium, similar to fig. 2, after cultivation on moist soil for seven days. The shaded head of the sporangium does not grow, but active cell-division and growth has gone on in the stalk (*st*). ×325.

Fig. 4. A similar sporangium with rather more enlarged head, showing superficial cells. ×325.

Fig. 5. A similar sporangium, showing irregular growth in the stalk. ×325.

Fig. 6. A sporangium after continued cultivation for twelve days; the stalk is much enlarged, and growth, with a wedge-shaped apical cell, has begun laterally from it. ×13).

Fig. 7. Flattened expansion produced by cultivation from an arrested sporangium; growth, with a wedge-shaped apical cell, appears to be progressing at more than one point. ×130.

PLATE XII.

Fig. 8. Part of a pinnule of *Athyrium F.-f. clarissima*, with vascular bundles (*vb*) and one sorus. Cultivation for five weeks has resulted in the development of prothalli from some of the arrested sporangia; these prothalli bear antheridia and archegonia, but are still attached to the pinnule which bore them. ×40.

Polystichum angulare, var. *pulcherrimum*.

Fig. 9. Apex of a pinnule which has grown out into a flattened expansion one layer of cells in thickness; this has not, however, as yet the distinctive characters of a prothallus. ×20.

Fig. 10. Apex of another pinnule, which has grown out into a flattened expansion of considerable size; this expansion has the characteristic structure of a prothallus, with marginal glandular hairs and thickened cushion; the latter bears on its under surface organs which proved, on cutting sections of the prothallus, to be mature antheridia and young archegonia. ×20.

Fig. 11. One mature antheridium from a section of the prothallus shown in fig. 10; it has not yet ruptured. ×325.

Fig. 12. One archegonium from a section of another specimen; it has passed the period of maturity without the neck having ruptured; the egg-cell has become disorganized. ×325.

Remarks on the Reproduction of the Heteræcious Uredines. By CHARLES B. PLOWRIGHT. (Communicated by W. T. THISELTON DYER, C.M.G., M.A., F.R.S., F.L.S.)

[Read 6th November, 1884.]

THE object of the present note is to draw attention to a point concerning the reproduction of the Heteræcious Uredines when this takes place without the intervention of the æcidiospores, which has apparently hitherto escaped notice. This simply is that, when the heteræcious species reproduce themselves without passing through the æcidial stage, the resulting uredospores are far more abundant than in the case when they arise from the implantation upon the host-plant of the æcidiospores.

My attention was first drawn to this in the summer of 1883, by some specimens of wheat received from two districts in

Australia, namely from New South Wales, communicated by Mr. A. H. Sampson, and from Queensland, communicated by Mr. James Sewell. Recently Professor Custance has kindly forwarded an extensive series of specimens, illustrating the same fact, from South Australia. These specimens were sent in compliance with a request made to these gentlemen for them. This arose from the pointed manner in which Australian farmers, in their letters to agricultural papers, complained of "rust" as injuring their wheat-crops; not, as our English farmers do, of "mildew." The fungus, however, is identical in both countries (*Puccinia graminis*); only in Australia the barberry, if it occurs at all, does so to a very limited extent in gardens &c. Not only are the uredospores less abundant in English specimens, but the teleutospores are produced at a much earlier period in life of the parasite.

A second instance is afforded by *Puccinia rubigo-vera* (DC.) in the eastern counties of England. Here we have an enormous development of the uredospores as compared with that of the teleutospores. The *Æcidium* occurs on certain of the *Boraginaceæ*, but must be exceedingly rare in this district, for although most careful search has been made for it annually for the past ten years, I have never yet gathered a fresh specimen. This is because the teleutospores are one of the earliest to germinate; they do so, in fact, before the foliage of the æcidial host-plant is, as a general rule, above ground, and in a condition to afford them a nidus. The *Æcidium* is most frequently found upon *Lycopsis arvensis*, an annual which, up to the present time (May 7), has not appeared above ground in the open, but since the end of March the wheat-crop has been severely affected by the uredospores of the fungus in question.

A third instance is afforded by *Puccinia obscura*. In a recent communication to the Linnean Society, I showed that this fungus has its æcidiospores upon *Bellis perennis*. Professor Farlow, on learning this fact, at once wrote to me to the effect that the *Puccinia* occurs with him in Massachusetts, but that the æcidial host-plant does not, and is only very rarely cultivated there in gardens. He was kind enough to send me specimens of the *Puccinia*, which were accompanied by a far more profuse development of uredospores than I have ever seen associated with our English specimens.

Since the above observations were made, I have received from

Mr. Rostrup, the eminent Danish mycologist, his paper upon "Heteræciske Uredineer" (1884). In this I am pleased to see the same fact has been noticed by him, but with different fungi. First with *Coleosporium senecionis,* which, when it occurs in districts where fir-trees are absent, consists almost wholly of uredospores; and, secondly, with *Chrysomyxa ledi.* He received from Greenland a specimen of *Ledum palustre,* upon which the uredospores of this fungus were present. Now De Bary has shown that æcidiospores of this *Chrysomyxa* occur upon *Picea excelsa,* a tree which does not grow in Greenland.

Report on the Botany of Mr. H. O. Forbes's Expedition to Timor-Laut, by W. T. Thiselton Dyer, F.R.S., Secretary to the British-Association Committee for the Exploration of the island; with a List of determinations of the Plants collected, by Prof. Oliver, F.R.S.

[Read 6th November, 1884.]

The Timor-Laut or Tenimber Islands are a small archipelago situated to the north of Australia, about halfway between the island of Timor and the Aru Islands. The natural history has hitherto been almost entirely unknown. In 1882 Mr. H. O. Forbes, aided by grants from the British Association, was enabled to spend the months of July, August, and September in the group.

He landed at the islet of Larat, which lies off the north-east coast of Yamdena (as the northern of the two portions of Timor-Laut is named), at a distance of about 15 minutes' sail.

Of the physical characters of the group Mr. Forbes gives the following account:—

"The Tenimber Islands, as seen from the sea, are very low. There are no hills; nothing over 400 feet on the northern island, nor on the surrounding islets, with the exception of Laibobar on the west coast of Yamdena, which rises to a height of about 1500 feet as seen from Larat across the mainland. The Tenimber group is surrounded (as I am told by the Commander of the Dutch man-of-War 'Samarang') by a very deep sea. The islands are entirely of coral formation. On the eastern shore of Yamdena there are coral-cliffs of about 100 feet in height, from which immense stalactites hang down. Along the beach are here and there blocks of tideworn sandstone; but nowhere have

I been able to find any sedimentary rocks. In the interior of Yamdena the coral lies a few inches below the surface, being covered only by a very thin layer of dark mould. There are absolutely no traces of sedimentary *strata*, with the exception of one small nodule of a fine calcareous limestone. Along the shore low coral-cliffs alternate with sandy baylets (the sand is almost entirely of fine particles of coral and minute shells and broken fragments of Echini &c.), which are studded also with worn coral boulders."

Mr. Forbes also furnished to the Committee of the British Association the following account of the general characters of the vegetation of the group as far as he was able to examine it:—"Of plants my collection is not so large as could be desired, owing to my inability to obtain any one willing to assist in felling or to climb trees, as I have always been able to do in Sumatra. The season was also unfavourable, it being during our stay the height of the dry season; besides I had the misfortune to have my drying-house, with 300 to 500 specimens, burnt to the ground, a conflagration which almost involved my house and endangered the village also. The forest is not very tall, few trees reaching even 80 feet, and has little undergrowth; but there is a thick sward of *Commelyna*. On the coral-rocks by the seashore several species of orchids grow, of which I have obtained living specimens. On trees at Cape Watoe Sianga, in Larat, where it faces the wind entering from the southern sea, I found a handsome and, I imagine, a new species of orchid; but I have been able only to see half-shrivelled flowers. At few other places have I seen any orchids; none on the mainland. Ebony, from the accounts of the natives (who make much use of it in their carved work), is found in considerable abundance. A very few species of ferns and two species of Lycopodiaceæ were found. A great species of *Sterculia* with dark lake flowers, which appear before the leaves, is one of the most conspicuous objects in the vegetation. Dammar trees occur; but the natives collect only to make lamps for themselves. The largest trees are figs of the genera *Urostigma* and *Ficus*; but, though abundant, they are few in species. *Artocarpus incisifolia* (but not the true bread-fruit tree) is abundant; but no *Artocarpus integrifolia* was met with. Leguminosæ and Myrtaceæ occur in considerable numbers, also low Compositæ and shrubby Apocynaceæ. Mingling in the belt of *Rhizophora*, where it is somewhat rocky, grows a species of

Pandanus. Of *Balanophora* one species was obtained, and a pretty species of Aristolochiaceæ; but both went in the conflagration. I have seen in the hands of the natives a species of wild mangosteen; the capsules were very thick, with almost no fleshy pulp. Tho natives eat the former, and throw away the latter. Of palms, only cocos, *Areca*, *Borassus*, and Sago were seen; neither *Eucalyptus*, phyllode-bearing Acacias, *Melaleucæ*, Casuarinas, nor *Melastomaceæ* were met with, and no sandalwood.

"Timor-Laut seems, from our present rough survey, to have great affinities with the Moluccan (Amboina) region; perhaps more than with the Timor group. The Insecta seem very closely to resemble those of Amboina; but the Lepidoptera and Coleoptera are excessively few."

Mr. Forbes's botanical collections (in the absence of more definite localities) were presumably made in Larat and Yamdena. They have not proved, on examination, so interesting as the zoological specimens brought back by him. But this may, no doubt, be attributed in great measure to the unfortunate accident by which so large a proportion of his dried plants appears to have been destroyed by fire. Still, in the face of our total ignorance of the nature of the flora of the group, it seems desirable to put on record a list of the species actually determined, even if it must be admitted that the general facies of the vegetation they indicate is somewhat common-place. A more thorough investigation of the forest of the interior than Mr. Forbes could perhaps afford time for would very probably yield more interesting results.

The determinations in the following list of species have been made by Prof. Oliver, F.R.S., who has added a few notes on such species as appear of more special interest. One of these is closely allied to a Queensland plant, and another belongs to a genus hitherto regarded as endemic in New Caledonia. As far, therefore, as the gathering indicates any distinctive peculiarities in the flora, they are with countries to the west of the Malayan archipelago. It is noteworthy in this connection that Mr. Sclater finds the affinities of the avifauna to be preeminently Papuan, with only a slight element from Timor*.—[W. T. T. D.]

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* Proc. Zool. Soc. Feb. 20, 1883, p. 56.

Amamirta Cocculus, *Wight et Arn.* (In fruit.)
Portulaca oleracea, *L.*
Ochrocarpus ovalifolius, *T. And.*? (Calysaccion obovale, *Miq.*)
Sida humilis, *Willd.*, var. repens.
Abutilon indicum, *Don.*
Hibiscus surattensis, *L.*
Thespesia populnea, *Corr.*
Sterculia fœtida, *L.*
Melochia velutina, *Bedd.*, var. glabrata.
Micromelum pubescens, *Blume.*
Murraya exotica, *L.*, var.
Glycosmis pentaphylla, *Corr.*, or possibly G. sapindoides, but flowers too young.
Tristellateia australasica, *A. Rich.*
Owenia sp., may be O. cerasifolia, *F. Muell.*; but in fruit only.
Carapa, *an* C. moluccensis, *Lam.*? Too young for identification.
Strombosia? Fruit only.
Erioglossum edule, *Blume*, forma.
Flemingia strobilifera, *R. Br.*
Desmodium umbellatum, *DC.*
Pongamia glabra, *Vent.*
Mucuna (§ Stizolobium) sp.
Canavalia obtusifolia, *DC.*?
Vigna lutea, *A. Gr.*
Dolichos Lablab, *Savi*?
Cynometra ramiflora, *L.* (C. bijuga, *Span.*)
Cassia javanica, *L.*?
Cæsalpinia pulcherrima, *Sw.*
Bauhinia Blancoi, *Benth.*?
Peltophorum ferrugineum, *Benth.*
Bruguiera caryophylloides, *Blume.*
Eugenia javanica, *Lam.*?
Momordica Charantia, *L.*
Zehneria, *aff.* Z. mucronatæ, *Miq.*
Delarbrea sp.? Interesting; a New-Caledonian genus.
Randia sp.
Ixora sp.
Ixora? Fruit only.
Ixora, *aff.* I timorensi, *Dcne.*
Psychotria? sp.
Vernonia cinerea, *Less.*
Weddelia biflora, *DC.*
Mæsa, sp. Allied to a species from the Indian archipelago.
Diospyros maritima, *Blume.*
Tabernæmontana parviflora, *Dcne.* (T. orientalis, *R. Br.*)
Marsdenia? Fruit only.
Gymnema? vel Sarcolobus? sp.
Cordia subcordata, *Lam.*
Tournefortia sarmentosa, *Lam.*
Hewittia bicolor, *Wight et Arn.*
Solanum verbascifolium, *L.*
Capsicum frutescens, *L.*, forma.
Acanthus ilicifolius, *L.* (Dilivaria ilicifolia, *Juss.*)
Hypoestes floribunda, *R. Br.*, var.
Eranthemum, sp.
Asystasia, *an* A. chelonioides, *Nees*?
Premna obtusifolia, *R. Br.*
Vitex trifolia, *L.* Form very near V. Negundo.
Leucas decemdentata, *Sm.*
Deeringia celosioides, *R. Br.*

Ærua scandens, *Wall.* (Æ. velutina, *Moq.*)
Piper, *aff.* P. canino, *Dietr.*
Myristica, *cf.* M. insipida, *R. Br.*
Loranthus (§ Dendrophthoe), sp., *aff.* L. rigido, *Wall.*?
Ficus, *aff.* F. acanthophyllæ, *Miq.*
—— spp. (Three species indeterminable from the material.)
Fatonia pilosa, *Gaud.* (F. lanceolata, *Dcne.*)
Lycopodium carinatum, *Desv.*
—— Phlegmaria, *L.*
Polypodium irioides, *Lam.*
Pteris tripartita, *Sw.*
Asplenium falcatum, *Lam.*
Vittaria elongata, *Sw.*

This collection, so far as it goes, is made up in great part of the more widely diffused species of the Indian archipelago.

The most interesting plants appear to be :—

A plant, in fruit only, which I would refer to the Meliaceous genus *Owenia*, perhaps indeed to *O. cerasifera*, F. Muell., of Queensland.

A fine *Mucuna* in fruit, of the section *Stizolobium*, which I have not identified.

A *Delarbrea*, an Araliaceous genus hitherto only received from New Caledonia.

A plant, in fruit only, which may be something new, though possibly a *Strombosia* (Olacineæ).—[D. O.]

Remarks on *Cinchona Ledgeriana* as a Species.

By EDWARD MORELL HOLMES, F.L.S.

[Read 20th November, 1884.]

THE name *Cinchona Ledgeriana* appears to have been first used in Cinchona plantations in the East Indies, to distinguish the trees grown from seed collected in the northern portion of Bolivia by an Indian servant of Mr. Ledger's, and which was subsequently distributed to Java, various plantations in India, and Ceylon.

When the plants flowered, Mr. J. E. Howard figured in his magnificent work 'The Quinology of the East-Indian Plantations' three forms of Cinchona which he had received from Java, as the produce of Ledger's seedlings, under the name of *Cinchona Calisaya* var. *Ledgeriana*, and gave a brief botanical description of the plant, by Dr. Weddell, in the accompanying text.

These illustrations represented respectively the male, female, and neutral forms of the plant. Notwithstanding the publication of these excellent coloured plates, there seems to have been ever since a considerable doubt among planters as to the characters by which the *Cinchona Calisaya* var. *Ledgeriana* might be recognized.

In consequence of this difficulty, Dr. Trimen published in the 'Journal of Botany' for Nov. 1881 figures and a description of what he considered to be the typical plant, and erected it into a species under the name of *Cinchona Ledgeriana*, Moens.

To this description Mr. Howard objected that the plant figured did not correspond with what he considered to be the typical *Ledgeriana* plant, as described by himself, and expressed the opinion, judging from the illustration alone, that Dr. Trimen's plant might be *C. micrantha* var. *calisayoides*. He also came to the conclusion, without seeing specimens of the tree, that the *Ledgeriana* described by Mr. T. N. Christie, of Ceylon, was probably *C. Calisaya* var. *microcarpa* of Weddell; but that those grown on the Yarrow Estate in Ceylon, by Mr. Laurie, were the true plant as described by himself under the name of *C. Calisaya* var. *Ledgeriana*, Howard.

Dr. Trimen, however, states positively that the three plants alluded to were all raised from the same small quantity of seed in the same nursery beds, and at the same time, and that they are all positively identical.

For my own part, I should have been content to have accepted the statement of either authority as final; but having received for the Museum of the Pharmaceutical Society three specimens of Cinchona-bark labelled "*Ledgeriana*," one of which was sent from Darjeeling by Dr. King, another from Ceylon by Mr. T. N. Christie, through the Planters' Association there, and a third from Java presented by Mr. Howard himself; and finding that all three differed in their external characteristics, only the Darjeeling one presenting the typical characteristics of Calisaya bark, I could come to no other conclusion than that several different varieties or forms, one or more of which are probably hybrids, are now grown in plantations under the name of *Cinchona Ledgeriana*.

Dr. Trimen, I believe, holds that the bark of Cinchona-trees does not present sufficient character for determination of species or affinity. My experience, however, on this point accords better with that of Mr. Howard, viz. that each species when mature presents a bark distinguishable both by external and internal characters, and that hybrids generally give some indication of the species to which they belong by the characters of the bark.

My grounds for this belief are the following. Specimens of the different varieties of Calisaya from wild trees and from cultivated trees in Bolivia, and from cultivated trees in Darjeeling, can be easily recognized as belonging to one type; and the same holds good with the typical forms of *C. officinalis* and *C. succirubra* *.

As a further illustration that the bark of trees of nearly allied species is easily distinguishable, I may appeal to a specimen of the flowering Ash, *Fraxinus Ornus*, L., now in the Botanic Gardens at Regent's Park, which was grafted many years ago on the trunk of the common *Fraxinus excelsior*, L. Here the difference in the two barks, above and below the line of juncture, is easily recognized.

The chemical analysis of Cinchona-bark also gives some clue to the species from which it has been derived, in the relative quantities and character of the alkaloids and colouring-matters prevalent in it.

So far as I am able to judge from the point of view of the physical characters of the bark, I am prepared to state positively that the *Cinchona Ledgeriana* from Darjeeling is undoubtedly that of a form of *Cinchona Calisaya*; and that in my opinion the specimen sent by Mr. Christie is a hybrid, apparently between *C. Calisaya* and *C. officinalis*, and that the one I received from Mr. Howard approaches more nearly in appearance to the Calisaya type than any other, although bearing some traces of hybridization with *C. officinalis*.

The history of the collection and distribution of Ledger's seeds also seems to support the view that the *Cinchona Ledgeriana* now in cultivation is not one well-marked species or variety, but embraces several varieties, some of which may be hybrids.

Thus Mr. Clements Markham, in his interesting work on Peruvian Bark (p. 214), distinctly states that the seeds were collected from about fifty trees. It is hardly to be supposed that these trees, in a district where the tree abounds, and of a species so variable as *Cinchona Calisaya*, would all consist of

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* Some specimens were placed on the table to illustrate this point.

exactly the same form or *variety**. The instructions given by Mr. Ledger to the Indian, on his return with the seeds, viz. to obtain *more* seeds of the roja, morada, and naranjada varieties of the Calisaya, indicate that these were the forms that he would have endeavoured to collect. Indeed Mr. Van Gorkom states that the Indian assured Mr. Ledger that the greater part of the seed came from "Roja" trees. Consequently, when these seeds became distributed, the seedlings should have possessed the characters of this and of other varieties of the Calisaya stock.

The further history of these seeds indicates that such was the case. Thus, Dr. Trimen remarks (Journ. Bot. Nov. 1881), "In India the young plants were not distinguished from other yellow bark trees" (p. 322). Again, "The progeny of the original seeds shows a good deal of variation." "The upper surface usually has a velvety sheen or reflect" (p. 324). Again, Mr. Howard describes the first plants he received from Mr. Moens as a variety of *C. Calisaya*, referring them at first to the var. *microcarpa.* He afterwards (Quin. E. I. Plant. p. 85), however, considered that they possessed sufficient differences in the small size of the flowers and fruits to be made a distinct variety, in which he was supported by the celebrated botanist Dr. Weddell, who, it must be remembered, had himself collected *Cinchona Calisaya* in its native haunts. Mr. Howard moreover remarks that the microscopical structure of the bark presents very distinctly the Calisaya type. He had noticed, indeed, among specimens sent from Java, subvarieties differing somewhat in the shape and tint of the flowers and leaves, but presenting no features to separate them as other than varieties of the Calisaya type. He remarked, however, that the bark is proportionately thicker in some of Ledger's plants than in other varieties of *Calisaya.*

Dr. Kuntze (Journ. Bot. 1883, p. 6) speaks of the *Ledgeriana* of Mungpo as a large shrub with divaricately-panicled inflorescence with slender ramification, like that of *C. micrantha*, whereas the descendants of Bolivian *Ledgeriana* in Java and Southern India are trees.

Mr. Van Gorkom (p. 92) remarks that the Ledger seeds sown in Java developed into handsome young trees without any sign, at least on a hasty glance, of showing themselves distinct from the indubitable *C. Calisaya*, the offspring of Java seed, but that when in 1872 they began to flower, it was observed that the flowers were smaller and of a creamy-white colour. The fruit also gave evidence of difference from the other Calisayas in cultivation.

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* Dr. Trimen remarks that there were some very bad trees of quite another type among those from the original sowing (Pharm. Journ. Jan. 19, 1884, p. 578, ftnote).

All plants of every other variety, except *C. officinalis* and *C. succirubra*, were subsequently turned out of the nursery, these being considered the most important to propagate. [This, however, it will be observed, was not before it had been possible for hybridization to take place.] When the plantations were reduced exclusively to Ledger's plants, it was noticed that the trees showed innumerable varieties of leaf; but after some experience it was found possible to point out with certainty the individuals of the common *Calisaya* which had slipped in, in repairing gaps. Still Van Gorkom admits that "there are many of the older Calisaya trees introduced by Dr. Hasskarl, which do not seem different from the *Ledgeriana*."

From the preceding remarks it may, I think, be concluded that the seeds supplied by Ledger resulted in a variety of forms of *C. Calisaya*, but that these were exposed to the chance of hybridization.

The probability that hybridization has actually taken place I ground upon the following facts: the specimens of bark already alluded to, which exhibit evidence of not being of pure Calisaya type; that Dr. Trimen states that in some plants of *Ledgeriana* the leaves are as broad as those of *C. officinalis*, var. *Condaminea*, so much so that it is not always easy to distinguish the two; that the bark presents considerable variability in appearance; that the upper surface of the leaves has usually (*i. e.* not invariably) a velvety sheen; and that the capsules he has seen are never "nearly globular" like those described by Dr. King. Dr. Trimen also states that, both in Sikkim and Java, the Ledgeriana trees have come *more* true from seed *since those species growing in their proximity have been cut down* (Journ. Bot. 1881, p. 322).

I take it for granted, then, that the *Ledgeriana* of the plantations is not a distinct form, but comprises several varieties of *Calisaya* as well as certain hybrids, and that the majority of these yield a large amount of quinine, this being the feature which is supposed to decide in doubtful cases (Van Gorkom, p. 93) whether or no a given tree is "*Ledgeriana*." It follows, then, that Dr. Trimen has described a species from doubtful materials, since he has taken the characters given, partly from growing specimens in Ceylon, from seed obtained by Mr. Mac Ivor from trees which *originated* from Ledger's seed, and which, as above mentioned, may consequently have undergone hybridization with other species (Journ. Bot. 1881), and partly from dried specimens of the original trees from Java. The characters which he has selected from these as distinguishing the *Ledgeriana* do not, however, present any features which entitle it to be separated from *C. Calisaya* as a distinct species.

The distinctive features adopted by Dr. Trimen, and emphasized by italics in his description (Journ. Bot. Nov. 1881), are as follows :—

1st. Leaves always having the broadest part at or about the middle.

2nd. Flowers small, drooping, or divaricate. Buds not at all, or very slightly, widened at the end, and never abruptly enlarged there.

With regard to these characters, the first accords well with the figure of *C. calisaya* var. *microcarpa* of Weddell's plate (Notes, p. 50), and cannot therefore be used to separate it from the Calisaya type. The small flowers are also characteristic of Weddell's *C. Calisaya* var. *pallida*, which on this account he would have regarded as a var. of *micrantha*, with smaller and narrower leaves than the type, were it not for the difference in the fruit. In Dr. Weddell's type specimens in the Kew Herbarium the flower-buds of the Calisaya are not widened at the apex.

I conclude therefore that there is not sufficient evidence produced by Dr. Trimen to show that his *Ledgeriana* is entitled to specific rank, or is indeed anything more than a variety of *C. Calisaya*. If, as Dr. Trimen states, and he is confirmed in his statement by Mr. Moens and Mr. Van Gorkom, the tree can be easily recognized in all plantations by the characters he has given, and if it be also characterized by yielding a high percentage of quinine, it is important that it should receive a distinctive name. As, however, Mr. Howard affirmed that the plant described by Dr. Trimen was not identical with the one described by him under the name of *Ledgeriana*, and as the *Ledgeriana* bark I have received from Ceylon is certainly not identical with Mr. Howard's bark so named, it would be advantageous, I think, that Dr. Trimen's plant should be distinguished as a horticultural form, belonging to the variety *pallida* of *C. Calisaya*, and differing from it chiefly in the presence of scrobicules (a feature which may be used to separate forms, but not varieties), until it can be ascertained definitely whether it is identical with the type of Weddell's *pallida*.

Doubtless there may be found among the descendants of Ledger's seeds some other forms of Calisaya already described by Weddell, as well as some hybrids yielding a large percentage of quinine; indeed this seems probable from the fact that Mr. Howard's *Ledgeriana* yields a large percentage, and is yet different from Dr. Trimen's plant.

I would suggest, therefore, to planters that herbarium specimens, gathered when in fully formed fruit, and accompanied by a characteristic portion of bark, should be kept for reference, of all forms that present a recognizable difference in habit of growth, appearance of bark, typical form of leaf, size and structure of flower, and shape and size of fruit. In this way only can the tangle be unravelled into which the mixture of a variety of seeds supplied by Mr. Ledger has led botanists.

Note on *Ranunculus Lingua*, Linn.

By Freeman C. S. Roper, F.L.S., F.G.S.

[Read 18th December, 1884.]

(Plates XIII. & XIV.)

Ranunculus Lingua is a plant very generally distributed in Britain, as it was recorded from 72 counties in Watson's Topographical Botany, and is stated in the second edition to occur in 77 counties. But it appears to be local and sparingly distributed in most parts of England; and I have only seen it in three localities in this part (Eastbourne) of Sussex. It is probably from this cause that the early primordial submerged leaves appear to be very little known, or generally overlooked; at all events, they are very rarely noticed by botanical writers. The specific descriptions given by the great majority of authors have been drawn up from the aerial leaves alone; and these differ so widely from the early submerged leaves that no one would imagine that they belonged to the same plant. I think, therefore, it may be useful to direct attention to these early leaves, of which the accompanying sketches are accurate representations, drawn to scale of about half the natural size.

On looking through the botanical works I have available, I find that out of thirty authors of general or local floras, seven describe the leaves of *Ranunculus Lingua* simply as "lanceolate;" three call them "lanceolate and amplexicaul;" two "lanceolate and nearly sessile;" and eleven describe them as "lanceolate, amplexicaul, and sessile." Thus twenty-three out of the thirty simply describe the long, narrow, lanceolate leaves of the flowering stem; whilst, on the other hand, there are only seven who allude to the early submerged leaves, although these alone are to be found for some months during the early part of the year.

These early submerged leaves differ in almost every respect from the aerial stem-leaves—as whilst these latter are narrow lanceolate, almost sessile, slightly sinuate-denticulate, frequently covered with adpressed hairs, and from three quarters to one inch in breadth,—the submerged leaves are three to four inches broad, ovate or oblong-ovate, cordate at the base, seven to nine inches long when full-grown, on petioles four to five inches long, rather membranous and semitransparent, perfectly glabrous, and not at all denticulate at the edges, and with a much more reticulate venation than the rather thick and almost coriaceous, opaque stem-leaves.

I will now briefly allude to the authors I have consulted. Gerard. Herb. 813 (1597), says ". . . long smooth leaves not unlike those of the Willow." Johnson, in his edition says "long leaves a little hairy, not unlike those of the Willow" (Ger. em. 961, 1633). Smith in Engl. Bot. ed. i. tab. 100 (1793), merely says "leaves lanceolate," a translation of the diagnosis in Linnæus's Sp. Plant., as used also by:—Hudson, Flor. Ang. 210, id. ed. 2. 340; Relhan, Flor. Cant. (1784) and (1820); Gren. & Godr. Fl. de Fr. 1848; Koch, Syn. Fl. Germ. 3rd ed. (1857); Bentham, Br. Fl., both editions, 1865 and 1878. In the 'Flore Française,' Lam. and DC. (1805) describe the leaves as "lanceolate and amplexicaul;" and are followed in this by Reich. Fl. Germ. Excurs. (1830–32), and Bouvier, Fl. des Alpes (1878). In With. Arr. Br. Pl. 1830, the leaves are said to be "lanceolate and nearly sessile," in which Woods, Tour. Fl. (1850), coincides. Gray, Nat. Arr. Br. Pl. 1821, is the first who describes the leaves as "lanceolate, slightly serrate, sessile, nearly embracing the stem;" and is followed by Grev. Fl. Ed. 1824; De Candolle's Prod. 1824; Bluff and Fing. Comp. Fl. Germ. 1825; Mack. Fl. Hibern. 1836; Hook. Br. Fl. edit. 4 (1838); Leight. Fl. Shrops. (1841); Bab. Man. ed. 1 to 7, 1843–1874; Gren. Fl. de la Ch. Juras. 1865–

1875; Breb. Fl. de la Norm. ed. 4 (1869); and Hook. Stud. Fl. ed. 1 to 3, 1870–1884.

Mr. Bentham, in Br. Fl. eds. 1 and 2, also states that the leaves, that is the long lanceolate leaves, to which alone he alludes, are "glabrous, with a few nearly parallel veins;" and Sir J. Hooker, in Stud. Fl. eds. 1 to 3, states that the plant is "glabrous," and that the leaves have "veins parallel and reticulated." These descriptions are not exactly correct, as both the aerial leaves and stem are in most cases densely covered with stiff adpressed hairs, at all events in my Sussex specimens; and the veins, instead of being parallel, are given off at various points of the mid-rib, and again anastomose at the tip of the leaf with the main central vein. They are, however, more or less reticulated both in the submerged and aerial leaves, but much more so in the former than in the latter. We thus see that in such standard books as Hook. Br. Flora, Gren. et Godr. Fl. de France, Koch Fl. Germ., Benth. Br. Fl., Hook. Stud. Fl., and Bab. Man. up to the 7th edit. (1874), no notice whatever is taken of the submerged leaves, nor would any one be able to recognize the plant if collected before the flowering-stems have appeared.

Of the seven authors who refer to the submerged leaves of *R. Lingua*, two are of old date, namely—Parkinson, who in his Theat. Botan. (1640), says of "*R. palustris flammeus major*":—"The Greater Marsh Spearwort hath a long joynted root, whence riseth up a thick joynted smooth stalke, two foot high, furnished with large and long shining and smooth thinner leaves, than in the next (*R. Flammula*), some being more than half a foote long and two to three inches broad, but smaller up to the toppe;" and Bauhin, in his 'Pinax,' 1623, under *R. longifolius palustris major*, says, "Folia prima aliquando subrotunda sunt."

There can be little doubt that these descriptions refer to the early submerged leaves, and not to the lanceolate leaves of the flowering-stem. The best and most correct description is that by Dr. Bromfield in his Fl. Vectensis (1856), who says, referring to the flowering-stem, "Leaves linear-lanceolate, erect, clasping the stem, thick, smooth or sometimes slightly hairy beneath, their edges with distant, very narrow serratures;" and he then proceeds to say:—"The earlier primordial submerged leaves are very large, ovate-oblong, obtuse, cordate at the base, slightly undulate crenate along the margins, on very long semiterete, somewhat hairy, sheathing petioles, obscurely and reticulately veined, remaining green throughout the winter." Again Boreau, in his Fl. du cent. de la Fr. edit. 3 (1857), says of *R. Lingua*, "produisant sous l'eau des feuilles longuement pétiolés, larges, cordiformes ovales." In Symes's Eng. Bot. ed. 3, 1863, we find:—"The earliest leaves, and those of the barren shoots on long stalks, ovate or oblong-ovate, those on the flowering-stem sessile, linear-lanceolate, very acute, faintly and remotely denticulate or nearly entire." Lloyd, in his Fl. de l'ouest de la Fr. 3rd edit. (1876), says :—"Feuilles demi-embrassantes lancéolées-linéaires, à dents courtes, obtuses, éloignées, les radicales submergées en cœur-ovales." And finally, Prof. Babington, in the 8th edition of the 'Manual,' 1881, after describing the stem-leaves as in previous editions, adds "early submerged leaves oblong, blunt, cordate at the base."

There is one point of interest about the submerged leaves of *R. Lingua* worthy of notice, and that is, that though the large, broad, early leaves are always submerged, never, as far as I have seen, even floating on the water, yet they have a considerable number of small oval stomata, as shown in Pl. XIII. fig. 2, about $\frac{1}{400}$ of an inch in length; similar in shape, but far less numerous and smaller in size than those on the aerial leaves, on which they are very abundant, and about $\frac{1}{300}$ of an inch in length, as shown in Pl. XIII. fig. 3. In most works on Structural Botany, stomata are said to be absent on submerged leaves. Sachs, however, states that they are occasionally found. May not their presence in *R. Lingua* tend to show that the submerged are modified aerial leaves, rather than that the large spreading submerged leaves have been contracted and modified by exposure to air?

Plate XIII. represents a plant of *Ranunculus Lingua*, collected in February 1878, whilst the whole plant was entirely submerged, drawn to scale of *rather less than* half the natural size. Pl. XIV. shows a plant collected in May of the same year, showing the flowering-stem, with one of the submerged leaves still remaining. Pl. XIII. fig. 2 are the small stomata from the submerged leaves; and Pl. XIII. fig. 3 are the larger stomata from the aerial leaves.

DESCRIPTION OF THE PLATES.

Plate XIII.

Fig. 1. Submerged leaves of *Ranunculus Lingua*, L., slightly less than half nat. size, from a marsh-ditch in Pevensey Levels, near the Waterworks, Eastbourne. Collected Feb. 21, 1878.

2. Stomata from submerged leaves, $\frac{1}{400}$ in. long, ×200.

3. Stomata from aerial leaves, $\frac{1}{300}$ in. long, ×200.

PLATE XIV.

Fig. 1. Submerged leaf; Fig. 2. Four aerial leaves; both half nat. size: from one stem of *R. Lingua*, likewise obtained from a marsh-ditch in Pevensey Levels, near to the Waterworks, Eastbourne, May 25, 1878.

Botanic Notes from Darjeeling to Tonglo and Sundukphoo.

By C. B. CLARKE, F.R.S., F.L.S.

[Read 15th January, 1885.]

IN the 'Journal of the Linnean Society,' vol. xv. p. 116, are printed some botanic notes of mine made on an excursion from Darjeeling to Tonglo in September 1876. I made a hasty excursion from Darjeeling on 2nd June, 1884, to Tonglo, and on to Sundukphoo, 15 miles further along the same ridge. There are now Government-furnished bungalows on this ridge between Sikkim and Nepaul, viz.:—Jore Pokri, from Darjeeling 13 miles, alt. 7500 feet; Tonglo, from Jore Pokri 10 miles, alt. 10,000 feet; Sundukphoo, from Tonglo 15 miles, alt. 12,000 feet; Phalloot, from Sundukphoo 13 miles, alt. 11,800 feet. There is a Government pony-path the whole way, and it is now easy to ride out to Tonglo in six hours. When Sir J. D. Hooker made his memorable excursion from Darjeeling to Tonglo in May 1848 (see Hook. Journ. Bot. ii. [1850] p. 17), there was no road round this ridge; and he followed the native path directly across the valley of the upper Rungait, having to work hard to get to Tonglo in three days. The new Government pony-path in many places winds along the side of the mountain, takes you into the gorges and over their torrents, and facilitates greatly the operations of the botanic collector. I have been along this ridge from Tonglo to Phalloot (and onwards north) on several occasions; but the old path was very much on the ridge, and so very rough and steep that one had to look continuously at one's feet. The present frontier-path and bungalows, designed by J. Ware Edgar, Dep.-Commissioner of Darjeeling in 1876, have thus aided the botanist, as well as rendered it easy for the denizens of Darjeeling to see the celebrated view from Sundukphoo. From the verandah of the bungalow, which is close to the summit of Sundukphoo, 12,000 feet alt., you look over the valleys of the Tambur and Arun upon the great Nepaul wall of snow, in the centre of which stands Deodunga (Mt. Everest), the highest mountain in the world: somewhat to the right is Kinchinjunga, its summit about 45 miles off still, but several of its big peaks (Pundim, Kubra, &c.) much nearer. Indeed, in some states of atmospheric refraction, Kinchinjunga seems to tower above you at Sundukphoo. These snows are the setting of a superb foreground. The mountain of Sundukphoo is a fine one, and its shoulders fall away so that from the summit you can follow with the eye far down its flanks; the masses of rock are interspersed with large patches of bright-green grass, over which is scattered, in very loose order, *Abies Webbiana*, Lindl., the type form, with truncated rigid heads and black-green foliage. The Rhododendrons, trees and shrubs, of various colours, reach for miles, and look like columns of troops converging on Sundukphoo, the summit of which the heads of the columns have just reached. The Rhododendrons were in a blaze when I was there on 5th June, 1884.

I append to this paper a list of the plants which I actually brought back from Tonglo and Sundukphoo from the present excursion. It must not be supposed to be at all a complete representation of the early spring vegetation: I only attempted to collect from 7000 to 12,000 feet altitude such plants as I knew I could not easily get near Darjeeling at 7000–8000 feet altitude. Moreover I was much hurried, I had poor weather (poor for Tonglo even), and all my servants fell ill. Still I do not think that I could, with every collecting advantage, obtain on this ridge in spring so many, or so many new, plants as I obtained on my former excursion in September. I have been surprised (I am always surprised over again) to see how late the spring is in Sikkim. In Darjeeling itself on 8th June, 1884, there were many trees, notably the *Erythrina*, so common in the station, that then scarcely showed the leaves emerging; and on Sundukphoo, at 12,000 feet, *Pyrus*, *Ribes*, &c., were in flower without leaves. This mountain-ridge has now been visited by many botanists, and at the time the Rhododendrons are in bloom, and my appended list contains hardly a single new species.

I observed with interest the great variability of the Rhododendrons within a limited area (but with variety of level and aspect) on Sundukphoo. The common species there, *Rhododendron campanulatum*, D. Don, varies from white to mauve and pink, two shrubs close beside each other differing greatly in colour; moreover the corolla varies in size and shape, some of the trees at lower levels having smaller and wider-mouthed corolla.

Rhododendron cinnabarinum, Hook. f., is in general rather a dull-coloured species, the brick-red shading off into a tawny yellow; but there were particular trees of this species, at various levels, on Sundukphoo of extraordinarily brilliant colour, the red having become a scarlet and the orange entirely disappeared. For gardening-purposes I can see that we must look to individuals, not to species. The cultivators of Rhododendrons must send men to these upper levels to mark particular trees in spring, and the men must come again in autumn and collect the seed of the marked trees.

I noticed the great variation with level of the Arisæmas. At 8000–10,000 feet *Arisæma Griffithii*, Schott, has the hood of the spathe very much dilated, 6–8 inches broad, curved and ridged; in the same species, at 12,000 feet alt., the spathe is less than one inch broad, and the dilatation and ridging are most obscure. I have called this the *same* species: as I walked up Sundukphoo, passing literally thousands of examples, the transition appeared perfectly gradual from the one extreme to the other. *Arisæma Hookerianum* and *A. utile* (I have looked at the numbered Hookerian specimens of these which Engler takes as types) are for me trifling varieties of *A. Griffithii.* If they are not, then I have several new species which differ a good deal more from *A. Griffithii* than they do. Whatever view is taken about the limits of species, there is no getting off this fork.

Similar considerable variations I noticed in the Lilies. In *Smilacina,* which is sorted in herbaria very much by the shape of the leaves, I find the leaves to vary so greatly in nearly every species, that I have no confidence that I can rightly refer the herbarium fragments, except such as show the flowers tolerably. Then, again, looking to cultivators' objects, *Smilacina oleracea,* Hook. f. et T. Thoms., in its commoner smaller forms, is an elegant, scarcely a striking plant; but I saw specimens with a drooping panicle of 200 snow-white flowers, which even my Bhootia coolies could not resist, several of them carrying a spray in one hand a few inches before the nose for miles.

List of Plants collected 2nd to 6th June, 1884, *on Tonglo and Sundukphoo, alt.* 7000–12,000 *feet.*

RANUNCULACEÆ.

Anemone obtusiloba, *D. Don*	9000	feet alt.
Ranunculus Cymbalariæ, *Pursh*	10,000	„
—— diffusus, *DC.*	9000	„
Var. floribus minimis	7000	„
Isopyrum adiantifolium, *Hook. f. et T. Thoms.* (carpellis semper 2, nec 3)	8000	„

MAGNOLIACEÆ.

Schizandra grandiflora, *Hook. f. et T. Thoms.*	8000	„
—— elongata, *Hook. f. et T. Thoms.*	7500	„

BERBERIDACEÆ.

Holboellia latifolia, *Wall.*	10,000	„
Berberis insignis, *Hook. f. et T. Thoms.*	9000	„

CRUCIFERÆ.

Cardamine trifoliolata, *Hook. f. et T. Thoms.*	9000	„
Draba gracillima, *Hook. f. et T. Thoms.*	12,000	„

VIOLACEÆ.

Viola biflora, *Linn.*	12,000	„
—— Hookeri, *T. Thoms.*	10,000	„
—— serpens, *Wall.*	7000	„
Var. canescens (sp. *Watt*)	7000	„
—— distans, *Wall.*	7000	„

CARPOPHYLLACEÆ.

Stellaria longissima, *Wall.*	7000	„
—— sikkimensis, *Hook. f.*	7000	„
—— bulbosa, *Wulf.*	12,000	„

TERNSTRŒMIACEÆ.

Actinidia strigosa, *Hook. f. et T. Thoms*	7500	„

GERANIACEÆ.

Oxalis Griffithii, *Edgew. et Hook. f.*	10,000	„

RUTACEÆ.

Zanthoxylon acanthopodium, *DC.*	7500	„
—— oxyphyllum, *Edgew.*	7500	„
Skimmia Laureola, *Hook. f.*	10,000	„

CELASTRACEÆ.

Euonymus frigidus, *Wall.*	10,000	„
Celastrus stylosa, *Wall.*	7500	„

VITACEÆ.

Vitis himalayensis, *Brandis*	7500	feet alt.

SAPINDACEÆ.

Acer Campbellii, *Hook. f. et T. Thoms.*	7000	,,
—— lævigatum, *Wall.*	7000	,,

ANACARDIACEÆ.

Rhus succedanea, *Linn.*	7000	,,

LEGUMINOSÆ.

Piptanthus nepalensis, *D. Don*	10,000	,,

ROSACEÆ.

Prunus nepalensis, *Seringe*	7500	,,
Spiræa bella, *Sims*	9000	,,
Rubus calycinus, *Wall.* (The "Ground-Raspberry.")	7000	,,
—— lasiocarpus, *Smith*	7000	,,
—— Hookeri, *Focke*	7500	,,
[=R. macrocarpus, *King*; *Journ. Linn. Soc.* xv. p. 142.]		
Rosa sericea, *Lindl.*	10,000	,,
Fragaria Daltoniana, *J. Gay*	10,000	,,
Pyrus rhamnoides, *DC.*	10,000	,,
—— foliolosa, *Wall.*	12,000	,,
—— microphylla, *Wall.*	12,000	,,
—— vestita, *Wall.*	10,000	,,
[=P. lanata?, *D. Don*; *Journ. Linn. Soc.* xv. p. 142.]		

SAXIFRAGACEÆ.

Astilbe rivularis, *Buch.-Ham.*	7000	,,
Saxifraga purpurascens, *Hook. f. et T. Thoms.*	12,000	,,
Tiarella polyphylla, *D. Don*	8000	,,
Chrysosplenium lanuginosum. *Hook. f. et T. Thoms.*	8000	,,
—— nepalense, *D. Don*	7000	,,
Ribes glaciale, *Wall.*	8000–12,000	,,

CUCURBITACEÆ.

Biswarea tonglensis, *Cogniaux*	8000	,,
[=Warea tonglensis, *C. B. Clarke, in Journ. Linn. Soc.* xv. p. 129.]		

BEGONIACEÆ.

Begonia Cathcartii, *Hook. f.*	8000	,,

ARALIACEÆ.

Aralia pseudo-ginseng, *Benth.*	10,000	,,
—— bipinnatifida, *C. B. Clarke*	10,000	,,

CORNACEÆ.

Aucuba japonica, *Thunb.*	7000	feet alt.

CAPRIFOLIACEÆ.

Viburnum erubescens, *Wall.*	10,000	„
—— cordifolium, *Wall.*	9000	„
Leycesteria formosa, *Wall.*	8000	„
Pentapyxis stipulata, *Hook. f.*	7500	„

RUBIACEÆ.

Lasianthus Biermanni, *King*	7000	„
Rubia cordifolia, *Linn.*	9000	„
Galium triflorum, *Linn.*	9000	„

COMPOSITÆ.

Ainsliæa pteropoda, *DC.*	7500	„

CAMPANULACEÆ.

Peracarpa carnosa, *Hook. f. et T. Thoms.*	8000	„

ERICACEÆ.

Vaccinium Nummularia, *Hook. f. et T. Thoms.*	9000	„
Pentapterygium serpens, *Klotzsch*	7500	„
Enkianthus himalaicus, *Hook. f. et T. Thoms.*	9000	„
Rhododendron campanulatum, *D. Don*	11,000–12,000	„
—— Dalhousiæ, *Hook. f.*	7000	„
—— arboreum, *Smith*	9000–11,000	„
—— barbatum, *Wall.*	11,000	„
—— cinnabarinum, *Hook. f.*	11,000–12,000	„
—— Falconeri, *Hook. f.*	10,000	„

PRIMULACEÆ.

Primula rotundifolia, *Wall.*	12,000	„
—— petiolaris, *Wall.*	12,000	„
Var. (? sp.)	11,000	„
Lysimachia prolifera, *Klatt*	8000–9000	„

MYRSINACEÆ.

Embelia Gamblei, *Kurz*	7500	„

STYRACEÆ.

Styrax Hookeri, *C. B. Clarke*	7500	„

LOGANIACEÆ.

Buddleia Colvillei, *Hook. f.*	9500	„

GENTIANACEÆ.

Gentiana capitata, *Buch.-Ham.*	12,000	„

BORAGINACEÆ.

Paracaryum glochidiatum, *Benth.*	9000	„

SOLANACEÆ.

Mandragora caulescens, *C. B. Clarke*	12,000	feet alt.

VERONICACEÆ.

Calceolaria mexicana, *Benth.*, efferata	8000	"
Sibthorpia pinnata, *Benth.*	8500	"
Hemiphragma heterophyllum, *Wall.*	8000	"
Veronica cana, *Wall.*	8000	"

CYRTANDRACEÆ.

Chirita Kurzii, *C. B. Clarke*	9000	"

LABIATÆ.

Ajuga lobata, *D. Don*	9000	"

PIPERACEÆ.

Peperomia reflexa, *A. Dietr.*	7000	"

LAURACEÆ.

Machilus odoratissimus, *Nees*	7000	"

THYMELACEÆ.

Daphne papyracea, *Wall.*	10,000	"

URTICACEÆ.

Pilea umbrosa, *Wedd.*	7000	"
—— scripta, *Wedd.*	8000	"
—— ternifolia, *Wedd.*	7000	"
Pilea sp. (A most minute species in full flower.)	12,000	"
Elatostema diversifolia, *Wedd.*	7000	"
Chamabaina squamigera, *Wight*	7500	"

ORCHIDACEÆ.

Liparis nepalensis, *Lindl.*	11,000	"
Cœlogyne corymbosa, *Lindl.*	7500	"
—— (§ Pleione) Hookeriana, *Lindl.*	10,000	"

ARACEÆ.

Arisæma speciosum, *Mart.*	7000–8000	"

Rhizome horizontal, short cylindric, with many rootlets on all sides. In all other Arisæmas known to me the rhizome is hemispheric, the whole lower (hemispheric) surface devoid of rootlets.

—— Griffithii, *Schott*	8000–12,000	feet alt.
—— nepenthoides, *Mart.*	10,000	"
—— Jacquemontii, *Blume*	7000	"

Abundant at lower levels (4000–7000).

LILIACEÆ.

Ophiopogon Wallichianus, *Kunth*	7500	feet alt.
Tupistra amarantoides, *Wall.*	7000	„
Smilax ferox, *Wall.*	7500	„
—— menispermoidea, *A. DC.*	10,000	„
Polygonatum punctatum, *Wall.*	7500	„
—— oppositifolium, *Royle*	7500	„
—— verticillatum, *Allioni*	10,000	„
Smilacina oleracea, *Hook. f. et T. Thoms.*	8000	„
—— purpurea, *Wall.*	10,000–12,000	„

[The plant called *S. purpurea*, Wall., in Journ. Linn. Soc. xv. p. 122, was *S. oleracea*, Hook. f. et T. Thoms.]

—— divaricata, *Wall.*	7500	feet alt.
Fritillaria cirrhosa, *D. Don*	12,000	„
Clintonia alpina, *Kunth*	12,000	„
Disporum, sp.	7500	„
Paris polyphylla, *Smith*	10,000	„
Trillium Govanianum, *Wall.*	12,000	„

[*Smilacina* sp., C. B. Clarke in Journ. Linn. Soc. xv. p. 122, was only seen at 8000 feet alt. in young bud, not collected.]

CYPERACEÆ.

Hemicarex Hookeri, *Benth. et Hook. f.*	12,000	feet alt.
Carex nubigena, *D. Don*	9000	„
—— remota, *Linn.*	8000	„
—— Daltoni, *Boott*	12,000	„
—— polycephala, *Boott*	8000	„
—— decora, *Boott*	9000–11,000	„
—— vesiculosa, *Boott*	9000	„
—— bengalensis, *Roxb.*	7500	„
—— filicina, *Nees*	7000	„
—— nepalensis, *Spreng.*	10,000	„
—— phacota, *Spreng.*	9000	„
—— pellucida, *Turcz.*	12,000	„

With three other Carices, for which I have not yet names.

GRAMINACEÆ.

Poa alpina, *Linn.*	9000	„

[I collected *Glyceria tonglensis*, C. B. Clarke (in Journ. Linn. Soc. xv. p. 119) at 7000 feet alt. on a lower ridge, but did not see it at this spring season at Tonglo.]

FILICES.

None collected. All in a very young stage, and none looked new or noteworthy.

List of the Plants collected by Mr. Thomson, F.R.G.S., on the Mountains of Eastern Equatorial Africa, by Prof. DANIEL OLIVER, F.R.S.; with Observations on their Distribution, by Sir J. D. HOOKER, F.R.S.

[Read 15th January, 1885.]

IN offering to the Linnean Society the accompanying catalogue, by Professor Oliver, of the small but very interesting herbarium made by Mr. Thomson in the highlands of Eastern Equatorial Africa, and presented by him to Kew, I think it may interest the Fellows if I preface it with some results in botanical geography which I have gleaned from a study of its contents.

I may premise that of the mountain flora of Equatorial Africa nothing whatever was known previous to 1860, when Mr. Gustav Mann, who had acted as botanist to Dr. Baikie's Niger Expedition, was (on Sir William Hooker's recommendation) instructed by the Secretary of State for Foreign Affairs to explore botanically the mountain-peaks of the Gulf of Guinea and its islands. Mr. Mann accordingly made several ascents of Clarence Peak, Fernando Po, alt. 9469 feet; one of St. Thomas's Island, alt. 7500 feet; and two of the Cameroons range, the culminating point of which he found to be 13,100 feet. The results of Mr. Mann's admirable labours are well known to this Society, being published in the 6th and 7th volumes of our Journal. To those results the following remarks may be regarded as complementary, and consisting of an extension of our knowledge of the mountain flora of Equatorial Africa from the western coast of the continent to the eastern.

Of collections made in the highest regions of Eastern Africa prior to those of Mr. Thomson, the only one known to me is that of the enterprising missionary, the late Rev. Mr. New, who was the first to reach and ascend the great mountain Kilimanjaro (in 1871), and who, at Dr. Kirk's instigation, collected a few flowering plants, about twenty in all, in the uppermost zone of vegetation. These were named by Prof. Oliver, and are published in Mr. New's Narrative. They are characteristic of a higher elevation than that obtained by Mr. Thomson on that mountain. Amongst them are two northern genera not collected by the latter traveller, *Artemisia* and *Bartsia*, which I have added to the list from which the following conclusions are drawn.

The localities from which Mr. Thomson's specimens were brought are, with their elevations:—

	Lat.	Long.	Elevation.		Species.
Kilimanjaro	S. 3° 0′.	E. 37° 30′.	9000–10,000 feet.		35.
Lykipia........	N. 1°–S. 1°.	E. 36° 37′.	6000–8000	,,	58.
Kapté plateau ..	S. 1°–2°.	E. 36° 37′.	5000–6000	,,	34.
Lake Naivaska..	S. 1°.	E. 36°.	7000–8000	,,	9.

The subjects most worthy of comment indicated by a study of these collections may be grouped as follows:—

1. The number and affinities of the plants characteristic of the European flora.

2. The number and affinities of plants characteristic of the South-African flora.

3. The comparison of the Eastern Equatorial mountain-flora with that of the western side of the continent.

4. The affinity of the flora with that of the highlands of Abyssinia.

5. Origin of the flora as assumed from these data.

1. *The Northern or European Element.*—Of the 107 genera and 140 species of flowering-plants, no less than 27 genera, including 37 species, are of a distinctly northern type, and comprise, amongst others, species of *Clematis*, *Ranunculus*, *Anemone*, *Delphinium*, *Cerastium*, *Hypericum*, *Geranium*, *Trifolium*, *Lotus*, *Epilobium*, *Caucalis*, *Galium*, *Scabiosa*, *Echinops*, *Artemisia*, *Sonchus*, *Erica*, *Swertia*, *Bartsia*, *Leonotis*, *Rumex*, *Juniperus*, and *Romulea*. And amongst the species are *Cerastium vulgatum* (two forms), *Caucalis infesta*, *Galium Aparine*, *Scabiosa Columbaria*, *Sonchus asper*, *Erica arborea*, and *Rumex obtusifolius*.

Of the above, the following genera have not been hitherto detected in South Africa:—*Delphinium**, *Caucalis*, *Echinops**, *Artemisia**, *Swertia*, *Bartsia*, *Leonotis**, and *Juniperus**. Those marked with an asterisk have not been found in the mountains of Western Africa; nor have the following:—*Anemone*, *Lotus*, *Epilobium*, and *Erica*. Thus no fewer than 9 northern genera are added to the Equatorial African flora by this small herbarium alone. Of all these the Juniper is the most interesting, as indicating the southern limit of that wide-spread northern genus, and the fact of its actually reaching the Equator. The southern limits hitherto ascertained of the genus *Juniperus* are:—In Asia N. lat. 28°, in the Eastern Himalayas, where it is not found under 8000 feet elevation; in America it extends far lower down, to Guatemala and the Jamaican mountains, N. lat. about 15°. In Africa the *J. procera* was found by Schimper in the Tigre mountains in N. lat. 14°. Having regard to the comparatively low elevation of the Lykipia forest and its equatorial position, it is evident that a little downward extension of the range of *Juniperus* would constitute it a tropical genus.

2. *The Southern or Temperate South-African Element.*—There are 35 genera in the above collections which are represented in South Africa, some of which there obtain their maximum, or are even almost peculiar to that region. The most notable of these are all those mentioned above as northern, with the exception of *Delphinium*, *Artemisia*, *Echinops*, *Swertia*, *Bartsia*, and *Juniperus.* And of other southern types there are the species of *Sparmannia*, *Calodendron*, *Psoralea*, *Alepidea*, *Felicia*, *Tripteris*, *Osteospermum*, *Berkeleya*, *Lightfootia*, *Blaeria*, *Selago*, *Struthiola*, *Podocarpus*, *Aristea*, *Gladiolus*, and *Kniphofia.* Of these, *Felicia*, *Osteospermum*, and *Alepidea* had not been previously found north of the Tropic of Capricorn. One species of *Clematis* is identical with the Cape *C. Thunbergiana*, as is the *Calodendron* with *C. capense*, and the *Alepidea* with *A. amatymbica*; and the *Anemone* is very near *A. capensis.* Of the rest most have representatives in Abyssinia or the mountains of Western Equatorial Africa.

No less than 15 of these South-African genera appear to be absent on the mountains of Western Equatorial Africa; they are:—*Anemone*, *Calodendron*, *Psoralea*, *Alepidea*, *Felicia*, *Tripteris*, *Berkeleya*, *Lightfootia*, *Erica*, *Selago*, *Leonotis*, *Struthiola*, *Aristea*, *Gladiolus*, and *Kniphofia.*

On the other hand, the mountains of the Gulf of Guinea contain many South-African genera not hitherto found in the Eastern equatorial mountains. Amongst the most notable of these are *Anthospermum*, *Hieracium*, *Ilex*, *Lasiosiphon*, *Peddiea*, *Geissorhiza*, and *Hypoxis.*

3. *A Comparison of the Eastern with the Western Mountain Vegetation* can only be profitably undertaken when the flora of the former is as diligently gleaned as was that of the latter by Mr. Mann; and we may hope for contributions towards this end from Mr. Johnston's exploration of Kilimanjaro. It is, however, worthy of remark, that of the genera found in the east and not hitherto in the west, the majority are of either Abyssinian or South-African types, whilst the compensating wealth

of the western flora is in European types not hitherto detected in the east.

4. *The Affinity of the Flora with that of the Highlands of Abyssinia* is very marked, as was to have been expected. Most of the genera are in fact Abyssinian, as are all, or nearly all, of the following species:—*Ranunculus oreophytus*, *Viola abyssinica*, *Sparmannia abyssinica*, *Geranium simense* ?, *Trifolium simense*, *Lotus tigrensis* ?, *Lythrum rotundifolium*, *Epilobium stenophyllum*, *Diplolophium abyssinicum*, *Caucalis melanantha*, *Coreopsis abyssinica*, *Lightfootia abyssinica*, *Erica arborea*, *Swertia Schimperi*, *S. pumila*, and *Juniperus procera*. Besides the above, the Abyssinian affinity is shown by the presence of an *Ueberlinia*, a genus hitherto known only as a monotypic Abyssinian one, and by the species of several of the other genera being more nearly allied to plants of that country than of any other.

5. *On the Origin of the Flora.*—The most striking feature of the flora thus first explored by Mr. Thomson is the discovery in Lykipia of three such typical forest-trees in close association as the *Juniperus procera* of Abyssinia, the *Calodendron capense* of South Africa, and the noble *Podocarpus*, a close ally both of the Cape *P. elongata* and of the eastern tropical *P. Mannii*, discovered on the top of the peak of the island of St. Thomas by the naturalist whose name it bears. And these three plants no doubt indicate the affinities of the flora being most strong with the countries north and south of it, and less so with that far to the east of it. This is what the configuration of the continent would indicate as most probable, the loftier mountains being on the east side, and being connected by more or less continuity of high land from Abyssinia to the Cape Colony. That the flora of the latter country extended into the former was well known; and this renders the discovery of a locality in the line of continuous migration or distribution, where the most marked type of the northern flora (*Juniperus*) meets the most marked of the southern (*Calodendron*), and this at the respective limits of each, a most interesting one, and only second in importance to the general result of Mr. Thomson's labours, which is the discovery of so many northern forms in the comparatively isolated equatorial tracts which he has been the first to explore.

Thus I think it may be regarded as most probable that the Equatorial African mountain-flora is in the main an immigrant one from Abyssinia, possessing many genera and species that have advanced even as far as the Cape Colony, besides many others that have not gone so far, and of which latter a few have been collected by Dr. Kirk during Dr. Livingstone's second expedition, in the mountains of comparatively low elevation near Lake Shirwa in lat. 15° S. In a lesser degree it has been peopled by a return flow of South-African genera and species, of which many have in like manner advanced further and reached Abyssinia, whilst others have been arrested in their northward spread. It would be interesting, but in the present state of our knowledge fruitless, to speculate on the direction in which the wave of migration is now advancing, and whether the later northern preceded the southern, or *vice versa*. Yet when it is considered that the whole area over which Mr. Thomson's collections were made is volcanic, and probably geologically modern, in its present configuration, it must be evident that the main features of its vegetation are of no great antiquity.

There is one more point of interest to which a study of Mr. Thomson's collection invites attention, which is that, whereas the lowlands of Eastern Tropical Africa (and indeed of all Tropical Africa) abound in species and representative species of the Deccan peninsula of India, the highlands of these two regions seem to have nothing in common, botanically or zoologically. And what renders this more noteworthy is that, though they have no types in common, there are desiderata common to both, as exemplified by the absence of Cupuliferæ, and paucity of Coniferæ, Cycadeæ, and Palmeæ, all of which abound in the Eastern Archipelago and in most other tropical countries. Looking still further off, and comparing the African flora with the Australian, a singular difference is observable in this, that whereas the Tropical-Australian flora is in very great measure made up of species belonging to Temperate-Australian genera, the Tropical-African is, except in the highlands, of a totally different type from the South-African. The tropical floras of both have been obtained largely from the Asiatic continent; but whereas in Australia there is a mingling of the Asiatic and endemic southern genera and species, there is no such mingling of the elements in Africa, except at considerable elevations, in its tropical regions.

J. D. HOOKER.

Catalogue of the Plants collected by Mr. J. Thomson in East Tropical Africa. By Prof. OLIVER, F.R.S.

1. CLEMATIS SINENSIS, *Fres.*, forma. Lykipia.

2. C. THUNBERGII, *Steud.*, var. SERICEA. Lykipia.

3. RANUNCULUS OREOPHYTUS, *Del.* Kilimanjaro.

4. ANEMONE THOMSONI, *Oliv.*, sp. n. (§ *Pulsatilloides*, *A. capensi*, L., aff.); foliis triternatim sectis segmentis cuneato-obovatis trifidis, lobulis ultimis obtuse acutatis paginis glabratis parce ciliolatis, petiolo gracili glabro, scapis 1–2-pedalibus gracilibus parce pilosis, involucro tripartito segmentis trifidis lobis linearibus vagina æquilongis, pedunculo apice dense piloso, sepalis 14–20 linearibus v. oblongo-spathulatis extus parce pilosulis glabratisve, carpellis (floriferis) dense hirsutis.

Kilimanjaro. The leaves are detached from the scapes, but I think not mismatched.

5. DELPHINIUM MACROCENTRON, *Oliv.*, sp. n. Herba erecta 2–3-pedalis vel ultra, pilosula, foliis caulinis palmatim 5-partitis segmentis (*fol. infer.*) 3–5fidis lobo centrali elongato lineari-lanceolato acuminato, fol. super. segmentis indivisis elongato-linearibus, racemis paucifloris pedunculatis, pedicellis erectis apice recurvis, floribus cæruleo-purpureis, calcare erecto subcylindraceo obtuso lamina 2–4plo longiore pilosulo, petalis anterioribus longe unguiculatis lamina oblongo-spathulata bifida parce setulosa, carpellis 3 pilosis, stylis longiusculis superne glabratis recurvis.

Lykipia.

Flores 1½–2 poll.; calcar ¾–1½ poll.

6. VIOLA ABYSSINICA, *Steud.* Kilimanjaro.

7. UEBELINIA ROTUNDIFOLIA, *Oliv.*, sp. n. Herbula foliosa, procumbens, caulibus pilis reflexis seriebus duabus longitudinaliter hirsutis, foliis suborbiculatis mucronulatis scaberulis sublævibusve setuloso-ciliolatis crassiusculis subsessilibus v. breviter latiuscule petiolatis, floribus quasi axillaribus folio brevioribus solitariis, calyce 5fido lobis ovatis apiculato-acutatis, petalis lineari-spathulatis calyce sublongioribus, staminibus 9–10, ovario ellipsoideo, stylis distinctis, seminibus paucis (4–5).

Kilimanjaro.

Folia ¼ poll. lata.

8. Cerastium vulgatum, *L.*, var. unilaterale. Lykipia.

9. C. vulgatum, *L.* Kilimanjaro.

10. Hypericum. *H. peplidifolio*, Rich. aff. (an var. calycis lobis 2plo longioribus?). Kilimanjaro.

11. H. lanceolatum, *Lam.* Lykipia.

12. Sida Schimperiana, *Hochst.* Kapté.

13. Abutilon indicum, *Don.* Lykipia.

14. Pavonia Schimperiana, *Hochst.* Kapté.

15. Hibiscus crassinervis, *Hochst.* Lykipia.

16. H. gossypinus, *Thunb.* Crater south of Lake Nairascha and Kapté.

17. Grewia occidentalis, *L.* Crater south of Lake Nairascha and Lykipia.

18. Sparmannia abyssinica, *Hochst.* Lykipia.

19. Geranium an *G. simense*? (folia radicalia). Kilimanjaro.

20. G. simense, *Hochst.*, var. glabrius. Kilimanjaro.

21. Impatiens Thomsoni, *Oliv.*, sp. n. Glaberrima, succulenta, foliis verticillatis ovalibus v. oblanceolato-ovalibus breviter acuminatis subsessilibus setoso-ciliatis pedunculis axillaribus unifloris supra medium bibracteatis folio sæpius brevioribus, sepalis lateralibus petalis 2–3plo brevioribus ovatis acuminato-apiculatis, sepalo postico ovato cucullato abrupte acuminato petalis breviore in calcar elongatum gracile abrupte producto, petalo antico rotundato amplo apiculato alis bipartitis æquilongo.

Lykipia.

Folia $3\frac{1}{2}$–$5\frac{1}{2}$ poll. longa, 1–$1\frac{1}{2}$ poll. lata. Flores ut videtur purpurei, $1\frac{1}{2}$–2 poll. diam.

22. Impatiens kilimanjari, *Oliv.*, sp. n. Herbula glabra, succulenta, ramosa, foliis alternis petiolatis ovatis acutiusculis latiuscule setoso-crenatis, pedunculis axillaribus folio sæpius longioribus 1-floris, sepalis lateralibus parvis ovatis lanceolatisve acuminatis, calcare cylindrico valido incurvato acuto ore dilatato breviter apiculato, petalo antico concavo late ovato apiculato, alis bifidis petalo antico æquilongis, lobo antico obovato postico angustiore obovato-oblongo.

Kilimanjaro.

Folia ½–¾ poll. longa, petiolo sæpius subæquilonga. Flores 1 poll. longi.

23. IMPATIENS, sp. nov. (Insufficient for description.) Crater south of Lake Nairascha.

24. CALODENDRON CAPENSE, *Thunb.* Kapté and Lykipia. Fine tree of 30–50 feet.

25. TURRÆA MOMBASANA, *C. de C. & H.*, forma. Crater south of Lake Nairascha.

26. HELINUS MYSTACINUS, *E. Mey.* Kapté.

27. CROTALARIA DILLONIANA, *Baker.* Kapté.

28. C. THOMSONI, *Oliv.*, sp. n. Fructiculus, ramosus, caulibus gracilibus ultimis hirtis, foliis petiolatis 3-foliolatis, foliolis ellipticis obovatisve obtusis mucronatis reticulatis pilis setisve paucis appressis pagina superiore v. utrinque onustis, floribus majusculis pedunculatis solitariis (v. geminis ?), pedunculis folio oppositis vel quasi terminalibus medio articulatis bracteatis apice bibracteolatis, bracteolis lineari-subulatis tubo calycis subæquilongis, calyce parce et appresse hirtello profunde 5fido lobis lanceolatis acutis, vexillo purpureo striato dorsi medio hirsuto calyce fere 2plo longiore.

Kapté.

Folia petiolo hirto gracili stricto ½ poll. longo v. breviore, foliolo centrali ½ poll. longo. Flores ½–⅔ poll. lati. Legumen turgidum, appresse hirtellum, utrinque attenuatum, apice stylo persistente falcato coronatum.

29. PSORALEA FOLIOSA, *Oliv.*, sp. n.; ramulis pubescentibus dense foliosis, foliis trifoliolatis brevissime petiolatis petiolo stipulis erectis lanceolatis sæpius breviore, foliolis oblanceolatis obtusis mucronatis brevissime petiolulatis glandulis immersis conspicue punctatis supra glabratis subtus præcipue in costa parce pubescentibus, floribus breviter pedicellatis in fasciculos terminales foliis breviores dispositis, calyce 5fido lobis acutis lobo antico subulato cæteris duplo longiore.

Lykipia.

Folia ¾–1½ poll. longa. Foliola 4–5 lin. longa. Legumen non vidi.

30. TRIFOLIUM SIMENSE, *Fres.*, var. ANGUSTIFOLIA. Lykipia.

31. TRIFOLIUM, sp. (Inadequate. Destroyed.) Kapté.

32. LOTUS TIGRENSIS, *Baker*? Crater south of Lake Nairascha.

33. VIGNA, sp. (Inadequate fragment.) Kapté.

34. CASSIA DIDYMOBOTRYA, *Fres.* Kapté.

35. LYTHRUM ROTUNDIFOLIUM, *Hochst.* Kapté.

36. EPILOBIUM STENOPHYLLUM, *Fres.* Kilimanjaro.

37. ALEPIDEA AMATYMBICA, *Eck.&Zey.*? (Imperfect.) Lykipia.

38. DIPLOLOPHIUM ABYSSINICUM, *Benth. & Hook. f.* Lykipia.

39. CAUCALIS MELANANTHA, *Benth. & Hook. f.*, var. Kapté.

40. C. INFESTA, *Curt.* Lykipia.

41. PENTAS SCHIMPERIANA, *Vatke.* Lykipia.

42. P. CARNEA, *Benth.*, forma. Kapté.

43. P. PURPUREA, *Oliv.*, forma. Lykipia.

44. GALIUM APARINE, *L.* Kilimanjaro.

45. SCABIOSA COLUMBARIA, *L.* Lykipia.

46. GUTENBERGIA CORDIFOLIA, *Benth.* Kapté and Lykipia.

47. VERNONIA, aff. *V. Melleri*, Oliv. & Hiern, an var.? Kapté.

48. FELICIA MURICATA (*Aster*, Less.), var.? Crater south of Lake Nairascha.

49. MICROGLOSSA VOLUBILIS, *DC.* Kapté.

50. SPHÆRANTHUS SUAVEOLENS, *DC.* Kapté.

51. S. GRACILIS, *Oliv.* sp. n. Herba 1½-pedalis, erecta, glaberrima, caule aptero gracili, foliis anguste linearibus utrinque attenuatis integris, capitulis compositis solitariis terminalibus pedunculatis hemisphæricis bracteis exterioribus paucis lineari-lanceolatis obtusiusculis floribus æquilongis, capitulis 9–12-floris, bracteis oblongis obtusis truncatisve apicem versus denticulatis floribus subæquilongis, floribus omnibus fertilibus v. 1–2 abortivis, acheniis crassiusculis leviter compressis parce hirtellis.

Kapté.

Folia 2–3 poll. longa, 1–2 lin. lata. Capitula ½ poll. diam., pedunculo 1–2 poll. longo.

52. DICHROCEPHALA CHRYSANTHEMIFOLIA, *DC.* Lykipia.

53. SPILANTHES ACMELLA, *L.*, forma. Kapté.

54. ACHYROCLINE SCHIMPERI, *Sch. Bip.* Kapté.

55. GNAPHALIUM, aff. *G. auriculato.* Kilimanjaro.

56. G. UNIONIS, *Sch. Bip.* Kapté.

57. HELICHRYSUM FŒTIDUM, *Cass.* Kapté.

58. H. ADENOCARPUM, *DC.*, var. ALPINUM. Kilimanjaro.

59. COREOPSIS, sp. nov.? Allied to *C. abyssinica*, Sch., and perhaps abnormal. Not in a state for description. Lykipia.

60. BIDENS PILOSA, *L.*—B. leucantha, *W.* Kapté and Kilimanjaro.

61. MALANTHERA BROWNEI, *Sch. Bip.* Kapté.

62. WEDELIA MOSSAMBICENSIS, *Oliv.?* Kapté.

63. GUIZOTIA, an *G. Schultzii*, Hochst.? Lykipia.

64. TRIPTERIS VAILLANTII, *Decne.* Kapté.

65. TRIPTERIS, sp. nov.? (No fruit.) Kilimanjaro.

66. EMILIA, aff. *E. angustifoliæ*, DC.? Lykipia.

67. GYNURA VITELLINA, *Benth.* Kapté and Lykipia.

68. CINERARIA ABYSSINICA, *Sch.*, forma. Lykipia.

69. SENECIO, sp. nov.? (Inadequate.) Kapté.

70. OTHONNA, sp. nov.? (1 capitulum only.) Crater south of Lake Nairascha.

71. ECHINOPS AMPLEXICAULIS, *Oliv.* Lykipia.

72. BERKHEYA SPEKEANA, *Oliv.* Lykipia.

73. CREPIS, sp.? (No leaves.) Lykipia.

74. SONCHUS ASPER, *L.* Lykipia.

75. LOBELIA. (Fragment.) Lykipia.

76. LOBELIA, an var. *L. coronipifoliæ*, L., foliis subintegris glabris? Crater south of Lake Nairascha.

77. LIGHTFOOTIA ABYSSINICA, *Hochst.*, var. tenuis, glaberrima, foliis anguste linearibus integris. Crater south of Lake Nairascha.

78. ERICA ARBOREA, *L.* Crater south of Lake Nairascha and Lykipia.

79. JASMINUM AURICULATUM, *Vahl.*—J. settense, *Kl.* Lykipia.

80. J. "ABYSSINICUM, *R. Br.*" Lykipia.

81. CARISSA, an *C. edulis*, Vahl? Lykipia.

82. Acokanthera (*Carissa Schimperi*, A. DC., *Strychnos abyssinica*, Hochst.) Mixed with the *Carissa*, but no doubt the plant to which the label "Murju—a deadly poison"—applies.

83. Gomphocarpus physocarpus, *E. Mey.*, or *G. abyssinicus*, Hochst.? Lykipia.

84. Swertia Schimperi, *Griseb.* Kilimanjaro.

85. S. pumila, *Hochst.* Kilimanjaro.

86. Swertia, sp. Lykipia.

87. Ehretia, an var. *E. abyssinicæ*? Kapté.

88. Cynoglossum lanceolatum, *Forsk.*? (Fragmentary.) Lykipia.

89. Solanum, sp. (Fragment.) Lykipia.

90. S. nigrum, *L.*, forma. Kilimanjaro.

91. Sopubia, an var. *S. Dregeanæ*, Benth.? Lykipia.

92. Alectra asperrima, *Benth.* Lykipia.

93. Rhamphicarpa? or Striga? (No fruit.) Kapté.

94. Rhamphicarpa ——? (No fruit.) Kapté.

95. Selago Thomsoni, *Rolfe*, sp. n. Annua, ramis erectis albido-pubescentibus, foliis lineari-lanceolatis subobtusis integris puberulis, capitulis terminalibus subglobosis in fructu parum elongatis, floribus sessilibus, bracteis linearibus obtusis pubescentibus, calyce 5-fido lobis subulato-linearibus arcte ciliatis, corollæ tubo brevi lobis oblongis tubo duplo brevioribus, staminibus styloque breviter exsertis, fructu ovoideo-globoso subcompresso.

Kilimanjaro.

Planta ½–1 ped. alt. Folia 3–6 lin. longa, ½–1 lin. lata. Capitula 2–3 lin. lata. Bracteæ 1 lin. longæ. Calyx ¾ lin. longus. Corolla 1 lin. longa. Fructus ½ lin. longus.—A very distinct species, approaching *S. cephalophora*, Thunb., in habit, but readily distinguished by its minute flowers. (*R. A. Rolfe.*)

96. Hebenstreitia integrifolia, *L.*? Crater south of Lake Nairascha.

97. H. dentata, *L.* Lykipia and Kilimanjaro.

98. Justicia neglecta, *T. And.*? Lykipia.

99. Justicia, sp. Lykipia.

100. DICLIPTERA, near *D. maculata*, Nees. (Fragment.) Lykipia.

101. BARLERIA, aff. *B. repenti*, Nees. Kapté.

102. CROSSANDRA, aff. *C. undulæfoliæ*, Salisb. Lykipia.

103. HYPOESTES ANTENNIFERA, *S. Moore*? Lykipia.

104. H. ROTHII, *And.*, var. PUBESCENS? Lykipia.

105. H. VERTICILLARIS, *R. Br.* Kapté.

106. THUNBERGIA FUSCATA, *T. And.* Kapté.

107. LANTANA KISI, *A. Rich.*? Lykipia.

108. LANTANA, sp. Kapté.

109. LIPPIA ASPERIFOLIA, *Rich.*? Kapté.

110. OCYMUM, sp. Lykipia.

111. OCYMUM, sp.? Kapté.

112. OCYMUM, sp. Lykipia.

113. PLECTRANTHUS, sp.? Kilimanjaro.

114. LEUCAS MASAIENSIS, *Oliv.*, sp. n. Herba decumbens, caulibus pilis brevibus decurvatis hirtellis, foliis petiolatis obovato-rotundatis obtusis late crenatis basi cuneatim late angustatis rotundatisve, verticillastris solitariis longiuscule pedunculatis multifloris, bracteolis anguste linearibus calycem subæquantibus, calyce tubuloso campanulato ore subæquali 12-dentato dentibus brevibus subulatis, corollæ labio antico 3-partito lobo centrali rotundato-obovato retuso, tubo calycem æquante.
Lykipia.

115. LEUCAS, aff. *L. stachydiformi*, Benth. Kapté.

116. LEONOTIS RUGOSA, *Benth.* Kapté.

117. MICROMERIA PUNCTATA, *Benth.*, var. Crater south of Lake Nairascha.

118. CYATHULA, an *C. globulifera*? Kapté.

119. ACHYRANTHES ARGENTEA, *Lam.* Kapté.

120. ÆRUA LANATA, *Juss.* Kapté.

121. RUMEX OBTUSIFOLIUS? (No leaves.) Kilimanjaro.

122. THYMELACEA, dub.; near *Synaptolepis*, but without hypogynous disk, and 8 faucial squamæ half as long as perianth-segments, entire or notched. (Fragmentary.) Crater south of Lake Nairascha.

123. **Struthiola Thomsoni**, *Oliv.*, sp. n., aff. *S. ovatæ*, Thunb. Frutex ramis erectis pilosulis superne dense foliatis, foliis enerviis laxe imbricatis verticillatis sessilibus ovato-lanceolatis ovalibusve subacutis concaviusculis paginis glabris pilosulo-ciliatis, bracteolis lineari-ovalibus conduplicatis folii dimidio brevioribus, floribus folio æquilongis v. leviter exsertis, tubo perianthii glabro apice dilatato, limbi lobis ovato-lanceolatis acutis glandulis setis subæquilongis lobis perianthii 4–5plo brevioribus.

Lykipia.

Folia 4–5 poll. longa.

A Cape type, not previously represented from Tropical Africa in the Kew Herbarium.

124. **Cluytia lanceolata**, *Forsk.* ? (*C. Richardiana*, M. Arg., var. ?) Lykipia.

125. **Juniperus procera**, *Hochst.* Tree of 80–100 feet. Lykipia.

126. **Podocarpus elongata**, *L'Hér.*, forma? Tree of over 100 feet. Lykipia.

127. **Habenaria pleistadenia**, *Reichb. f.*, sp. nov. Ultra spithamæa, foliis basilaribus (geminis ?) cuneato-oblongis apiculatis (0·07–0·02 m.), siccis bene nervosis, caule gracili solido (excl. inflorescentia 0·21 alto, inflorescentia 0·06), inferne calvo, medio pilis glandulosis sparsis, apicem versus ac apice copiosissimis vestito, vaginis distantibus lineari-lanceis acuminato-subulatis paucis glandipilibus, racemo densiusculo plurifloro dein secundifloro, bracteis anguste lanceo-acuminatis glandipilibus ovaria glandipilia demum curvula non æquantibus, sepalis triangulis obtusis, lateralibus sublongioribus, omnibus extus parce hinc glandipilibus, tepalis ligulatis acutis superne sepalum impar versus obtuse-angulatis, labello ligulato acuto basi utrinque falcula lineari-acuminata diametrum laminæ transversum non excedente, cruribus stigmaticis abbreviatis retusis, canalibus antheræ ascendentibus brevissimis.

Kilimanjaro 9000–10,000 feet.

Affinis *Habenariæ croceæ*, Schweinf., et *Guinganjæ*, Rchb. f.; foliis ac pilis glandulosis abunde distincta.—*H. G. Reichb.*

128. H. **Thomsoni**, *Reichb. f.*, sp. nov. Affinis *Habenariæ humiliori*, Rchb. f., ultra spithamæa, foliis basilaribus oblongis, caulinis in vaginas acutas abeuntibus, racemo densiusculo, bracteis

oblongis acutis ovaria pedicellata æquantibus, margine et disco externo muriculatis, ovariis pedicellatis sublævibus, sepalo impari oblongo obtuso, sepalis lateralibus inæqualibus, margine inferiori extrorsum obtusangulo, apiculatis, tepalorum partitione superiore lineari margine muriculata, partitione labellum attingenti lancea, medio oblique plicata, saltem apicem versus margine minute muriculata, labelli partitionibus lateralibus lanceis acutis apice recurvis partitione mediana longiori lancea porrecta, calcare a basi teneriori antrorsum ampliato obtusiuscule acuto (semper medio flexo plicato ?) ovarium pedicellatum non æquante.

Lykipia, 6000–8000 feet.

Illustri peregrinatori magno cum gaudio dicata. Ex grege *Habenariæ cultratæ*, A. Rich., Schimperi, Hochst., etc., tepalis ac calcare egregia.—*H. G. Reichb.*

129. HABENARIA, aff. *H. nyikanæ*, Reichb. f. Lykipia.

130. HABENARIA, aff. *H. kilimanjari*, Reichb. f. Lykipia.

131. ANGRÆCUM, sp. (No leaves.) Lykipia.

132. SATYRIUM, sp. Kilimanjaro.

133. ORCHIDACEA, dub. Kilimanjaro.

134. ARISTEA ALATA, *Baker*, sp. n.; foliis ensiformibus rigidulis margine hyalinis, caule e basi ad apicem conspicue alato foliis 2 reductis supra medium instructo apice furcato, spathæ valvis exterioribus lanceolatis dorso firmulis margine hyalinis, interioribus hyalinis integris pallide brunneis, fructu oblongo obtuse angulato, pedicello fructui æquilongo vel paulo longiori.

Lykipia, Masai country, alt. 6000–8000 feet.

Folia basalia pedalia et ultra. Caulis 1½–2 ped. Spathæ valvæ exteriores 7–8 lin. longæ. Capsula 4–4½ lin. longa. Perianthium marcescens solum vidi.

Easily distinguished by its long, distinctly winged stems and small oblong obtusely angled capsule with a long pedicel.

The genus has its head-quarters at the Cape, with outliers in Angola, Abyssinia, and Madagascar.—*J. G. Baker.*

135. GLADIOLUS QUARTINIANUS, *A. Rich.* Lykipia.

136. G. (§ EUGLADIOLUS) WATSONIOIDES, *Baker*, sp. n. Elatus, grandiflorus, foliis linearibus subcoriaceis glabris, caule tereti foliis 2–3 reductis instructo, spica laxa 6–8-flora unilaterali, spathæ valvis lanceolatis firmulis magnis inæqualibus, perianthii

splendide rubri tubo anguste infundibulari limbo longiori, limbi segmentis oblongis vel oblongo-lanceolatis, genitalibus limbo distincte brevioribus,

Kilimanjaro.

Folia 4–6 lin. lata, basalia sesquipedalia. Caulis (spica inclusa) 3–4-pedalis. Spathæ valva exterior 1½–2½ poll. Perianthii tubus 18–20 lin. longus, ore 3 lin. diam., limbus 15–16 lin. longus, segmentis 4–7 lin. latis.

This may be the plant gathered by Von der Decken and Kersten, which Dr. Klatt has referred (Bot. von Ost-Afrika, p. 73) to *G. Garnierii*; but it is, I think, quite distinct specifically from the original Madagascar plant so called, which is the same that was distributed long ago by Hilsenberg and Bojer under the name of *G. ignescens*, and which I characterized under that name in 'Trimen's Journal,' 1876, p. 334. It is quite different from the Kilimanjaro *G. Newii*, Baker in 'Trimen's Journ.' 1876, p. 334.—*J. G. Baker*.

137. KNIPHOFIA THOMSONI, *Baker*, sp. n.; foliis linearibus acute carinatis margine scabris venis inter costam et marginem 14–16, racemo cylindrico elongato, pedicellis fructu sæpe longioribus bracteis lanceolatis acuminatis pedicello longioribus, perianthio cylindrico-infundibulari segmentis brevibus obtusis, staminibus inclusis, stylo demum exserto, fructu globoso magnitudine pisi.

Kilimanjaro.

Folia pedalia et ultra, basi 6–8 lin. lata. Racemus demum pedalis vel sesquipedalis, pedicellis 1½–2 lin. longis. Perianthium 12–13 lin. longum, ore 2 lin. diam. Capsula 2 lin. diam.

This comes nearest to the Cape and Natal *K. sarmentosa*, Kunth (Bot. Mag. t. 744), and the equatorial *K. Grantii*, Baker. Half a dozen species are now known in Abyssinia; and one has lately been discovered in Central Madagascar.—*J. G. Baker*.

138. ROMULEA CAMEROONIANA, *Baker*. Kilimanjaro.

139. CYANOTIS HIRSUTA, *Fisch. & Mey.*, var.? Lykipia.

140. CAREX (fragment only), an *C. Steudneri*, Böckler, vel *C. Köstlini*, Hochst.? Kilimanjaro.

Further Contributions to the Flora of Madagascar.—Second and Final Part. By J. G. BAKER, F.R.S.

[Read 15th January, 1885.]

IN the present paper are described the remainder of the novelties sent home by Mr. Baron up to the end of 1883. A report on the earlier half of the same set is printed in Journ. Linn. Soc. *anteà*, pp. 317–353. Type specimens of all of them will be found in the Kew Herbarium, and a large number of them also at the British Museum. Fine and extensive collections have lately been sent to Europe from the north-west of the island by M. Humblot; and distribution has been made of the large gatherings made in the central provinces by the late lamented Dr. Hildebrandt; so that our knowledge of Madagascar botany at the present time is advancing rapidly. As Dr. Hildebrandt and Mr. Baron have worked over the same ground, the plants they have obtained are very often identical; but Humblot's are mostly different.

MONOPETALÆ.

SCHISMATOCLADA CONCINNA, n. sp.

Arborea, glabra, stipulis deltoideis, foliis breviter petiolatis obovato-cuneatis cuspidatis subcoriaceis, floribus in paniculas terminales pedunculatas ramulis corymbosis dispositis, pedicellis brevissimis, calycis tubo campanulato dentibus deltoideis, corollæ tubo cylindrico segmentis oblongis tubo triplo brevioribus, staminibus segmentis æquilongis, fructu oblongo ad basin bifido valvis rigidulis.

A much-branched shrub, glabrous in all its parts, with slender terete branchlets. Leaves $1\frac{1}{2}$–2 in. long, narrowed from the middle to the base, moderately firm in texture, green and glabrous on both surfaces, with fine ascending main veins. Flowers copious, arranged in terminal panicles, with flat-topped branches. Calyx $\frac{1}{24}$ in. long; teeth deltoid, as long as the tube. Corolla-tube $\frac{1}{4}$ in. long. Anthers linear, inserted at the throat of the corolla-tube; filaments filiform, equalling the anthers. Capsule $\frac{1}{3}$ in. long, splitting down to the base into two valves.—*Baron* (without number).

SCHISMATOCLADA VIBURNOIDES, n. sp.

Glabra, stipulis deltoideis, foliis confertis subsessilibus obovato-oblongis obtusis subcoriaceis, floribus in corymbos densos terminales pedunculatos

dispositis, pedicellis brevissimis, bracteis lanceolatis, calycis tubo campanulato dentibus parvis ciliatis deltoideis, corollæ tubo elongato cylindrico, segmentis ovato-oblongis tubo 5–6plo brevioribus, staminibus segmentis æquilongis.

An erect shrub, with straight branchlets, glabrous in all its parts; internodes very short; stipules deltoid. Leaves ascending, subsessile, firm in texture, 3–4 in. long, 1¼–1½ in. broad at the middle, narrowed from the middle to the base, green on both surfaces, with fine indistinct main veins. Flowers numerous, arranged in dense terminal corymbose cymes; pedicels very short; bracts small, lanceolate, persistent, ciliated. Calyx $\frac{1}{16}$ in. long; teeth deltoid, ciliated. Corolla-tube ¾ in. long, hairy all down inside; segments ⅛ in. Anthers ⅛ in. long, versatile. Style reaching to the top of the corolla-tube, shortly bifid. Fruit not seen.—*Baron* 3220!

DANAIS VESTITA, n. sp.

Fruticosa, ramulis rectis dense fusco-pilosis, foliis petiolatis oblongis acutis subcoriaceis facie scabris dorso pubescentibus, floribus in cymas corymbosas axillares dispositis, pedicellis productis, bracteis minutis lanceolatis, calycis villosi segmentis lanceolatis tubo campanulato longioribus, corollæ tubo cylindrico apice infundibulari, segmentis lanceolatis tubo quadruplo brevioribus, staminibus exsertis.

A shrub, with straight terete branchlets densely clothed with spreading brown hairs. Stipules deeply lacerated, with ciliated lanceolate segments; petiole very short, densely pilose; blade 3–4 in. long, 1½–2 in. broad, acute, rounded at the base, rough with short bristly hairs above, softly brown-pubescent beneath, with 8–10 pairs of raised arcuate-ascending main veins. Flowers in copious cymes in the axils of the leaves; pedicels ¼–⅓ in. long, densely villose, as are the bracts and calyx. Calyx with a globose tube and 5 lanceolate segments ⅙ in. long. Corolla-tube glabrous, ⅝–¾ in. long, funnel-shaped at the apex; segments lanceolate, ⅙ in. long. Stamens twice as long as the corolla-segments. Fruit not seen.—*Baron* 2329!

PENTAS MICRANTHA, n. sp.

Herbacea, caulibus gracilibus glabris, stipulis parvis deltoideis, foliis brevissime petiolatis oblongis acutis membranaceis, floribus in cymas capitatas terminales pedunculatas dispositis, pedicellis nullis vel brevissimis, calycis dentibus lanceolatis foliaceis inæqualibus tubo campanulato æquilongis, corollæ tubo deorsum cylindrico sursum infundibulari, segmentis parvis patulis ovato-lanceolatis, fructu globoso, seminibus in loculo pluribus minutis.

Herbaceous, probably annual, with slender elongated glabrous stems. Leaves in distant pairs, shortly petioled, membranous, 2–3 in. long, narrowed from the middle to both ends, slightly pubescent. Flowers a dozen or more together in congested peduncled terminal cymes. Calyx finally $\frac{1}{6}$ in. long, with 5 unequal lanceolate foliaceous teeth and a campanulate tube. Corolla with a tube $\frac{1}{4}$ in. long, and an expanded limb not more than $\frac{1}{6}$ in. in diam. Capsule globose, projecting at the apex from the calyx, splitting into two valves at the top, with very numerous minute seeds in each of the two cells.—Forests of Tanala province, *Baron* 310! also 3292!

OLDENLANDIA LATIFOLIA, n. sp.

Herbacea, annua, caulibus diffusis e basi copiose ramosis gracilibus obscure pilosis, foliis sessilibus oblongis parvis membranaceis obtusis vel subacutis, floribus axillaribus solitariis sessilibus, calycis dentibus lanceolatis tubo campanulato æquilongis, corollæ albæ segmentis oblongis tubo cylindrico æquilongis, capsulis oblongis, seminibus in loculo paucis oblongis nigris.

An annual, with weak slender stems, diffusely branched from the crown of the root. Leaves oblong, membranous, sessile or nearly so, $\frac{1}{2}$–$\frac{3}{4}$ in. long, slightly pilose; stipules entire, deltoid. Flowers solitary in the axils of the leaves all down the stem. Calyx hispid, finally $\frac{1}{6}$ in. long, with 4 foliaceous lanceolate persistent teeth as long as the campanulate tube. Corolla white, $\frac{1}{4}$ in. long. Capsule broad oblong, splitting down from the apex to the base into two valves. Seeds few in each cell, minute, oblong, with a black testa.—*Baron* 307! Also South Betsileo, in the wood of Ankafina, *Hildebrandt* 3941! Allied to the Cape *O. rupicola*, Sonder.

HEDYOTIS TRICHOGLOSSA, n. sp.

Fruticosa, glabra, ramulis gracillimis, stipulis parvis deltoideis, foliis petiolatis oblongis acutis membranaceis, floribus in cymas laxas terminales pedunculatas dispositis, pedicellis brevissimis, calycis dentibus 4 deltoideis tubo campanulato æquilongis, corollæ albæ tubo cylindrico, segmentis lingulatis pilosis tubo vix brevioribus, antheris lineari-oblongis filamentis brevissimis, stylo flori æquilongo.

A shrub, glabrous in all its parts, with very slender straight terete branchlets. Leaves shortly petioled, oblong, acute, deltoid at the base, about 2 in. long by under an inch broad, bright green, glabrous on both surfaces, distinctly pinninerved. Flowers in lax terminal peduncled corymbose cymes; pedicels very short. Calyx $\frac{1}{16}$ in. long, glabrous; tube semiglobose. Corolla white, under $\frac{1}{4}$ in. long, with 4 lingulate ascending segments nearly as long as the tube, and densely pilose inside. Style slender, forked, overtopping the anthers. Fruit not seen.—*Baron* 2782!

MUSSÆNDA FUSCOPILOSA, n. sp.

Fruticosa, ramulis lignosis dense fusco-pilosis, stipulis lanceolatis, foliis petiolatis oblongis subobtusis facie parce dorso magis fusco-pilosis, floribus paucis terminalibus subsessilibus umbellatis, bracteis lanceolatis, calycis magni segmentis lanceolatis tubo hirsutissimo longioribus, corollæ tubo cylindrico dense piloso 3–4-pollicari, segmentis oblongo-lanceolatis tubo quadruplo brevioribus, genitalibus in tubo inclusis.

A shrub or tree, with terete woody branches, clothed with spreading bright-brown hairs. Leaves 4–5 in. long, moderately firm in texture, deltoid at the base, green and slightly hairy above, more hairy beneath, with 12–14 pairs of arcuate-ascending veins. Flowers 3–4 together in terminal nearly sessile umbels. Flower-calyx $\frac{3}{4}$–$\frac{7}{8}$ in. long, the lanceolate teeth exceeding the densely pubescent oblong tube. Corolla-tube densely pubescent, 3–3$\frac{1}{2}$ in. long; segments patent, $\frac{3}{4}$–1 in. long. Stamens and style included in the corolla-tube. Fruit not seen.—*Baron* 2467! 2470!

MUSSÆNDA MACROPODA, n. sp.

Erecta, fruticosa, ramulis apice pilosis, foliis longe petiolatis oblongis obtusis vel subacutis facie glabrescentibus dorso tenuiter pilosis, floribus copiose corymboso-paniculatis, pedicellis brevibus, calycis sericei dentibus lanceolatis tubo turbinato æquilongis, corollæ tubo dense sericeo sesquipollicari, segmentis oblongis cuspidatis tubo 3–4plo brevioribus.

An erect shrub or tree, with woody branchlets, thinly pubescent towards the tips. Leaves oblong, moderately firm in texture, 3–4 in. long, green and finally glabrous above, deltoid at the base, obscurely pubescent beneath, with 8–9-jugate distinctly raised arcuate-ascending veins. Flowers in copious terminal shortly-peduncled corymbose panicles; bracts rigid, lanceolate, persistent; pedicels often $\frac{1}{8}$–$\frac{1}{6}$ in. long. Flower-calyx $\frac{1}{2}$–$\frac{5}{8}$ in. long, the lanceolate-acuminate teeth equalling the densely grey-silky ovary. Corolla with a densely silky tube 1$\frac{1}{2}$–1$\frac{3}{4}$ in. long; segments oblong-cuspidate, $\frac{1}{2}$ in. long. Stamens and style not exserted from the corolla-tubes.—*Baron* 3088! Allied to *M. trichophlebia*, Baker in Journ. Linn. Soc. xx. p. 166, and the Mauritian *M. Landia*, Lam.

TARENNA (§ WEBERA) MACROCHLAMYS, n. sp.

Arborea, ramulis crassis apice ferrugineo-pubescentibus, stipulis magnis rigidis caducis, foliis petiolatis obovatis emarginatis coriaceis magnis facie glabrescentibus dorso venulosis ferrugineo-pubescentibus, floribus copiosis in paniculas terminales ramis cymosis primum bracteis magnis ovatis coriaceis cinctas dispositis, pedicellis sæpissime productis brevibus, calycis tubo globoso, limbo brevi truncato, corollæ tubo brevi cylindrico, segmentis oblongis tubo æquilongis, fructu globoso lævi magnitudine pisi.

An erect tree, 30–40 feet high, with stout terete branchlets, clothed upwards, as are the branches of the panicle and underside of the leaves, with short ferruginous pubescence. Stipules large, rigid, orbicular, spathulate. Leaves thick and rigid in texture, 4–6 in. long and nearly as broad, prominently emarginate at the apex, all the veins and veinlets conspicuously raised beneath. Panicle ample, terminal, with very numerous divaricated dichotomously cymose branchlets. Calyx-tube coriaceous, semiglobose, $\frac{1}{12}$ in. in diam.; limb short, collar-like, truncate. Corolla $\frac{1}{6}$ in. long. Fruit indehiscent, coriaceous, black, smooth, $\frac{1}{6}$ in. in diam., with several tightly-packed seeds in each cell.—*Baron* 423 ! 1241 ! 1956 ! Forest of Andrangaloaka, *Dr. G. W. Parker* !

PLECTRONIA (§ CANTHIUM) BUXIFOLIA, n. sp.

Fruticosa, glabra, stipulis parvis deltoideis, foliis breviter petiolatis parvis oblongis lucidis subcoriaceis, floribus in umbellas multas axillares paucifloras dispositis, pedicellis calyce 3–4plo longioribus, calycis tubo campanulato dentibus minutis deltoideis, corollæ tubo infundibulari segmentis ovatis, fructu duro compresso didymo conspicue emarginato.

An erect shrub, glabrous in all its parts, with slender straight branchlets. Leaves firm in texture, bright green, 1–1½ in. long, deltoid at the base, shining on both surfaces, the veining fine and indistinct. Flowers 4–6 together in umbels in the axils of the leaves all down the branchlets; pedicels $\frac{1}{6}$–$\frac{1}{4}$ in. long. Calyx-tube globose, green, $\frac{1}{24}$ in. in diam. Corolla $\frac{1}{6}$ in. long. Fruit hard, didymous, compressed, $\frac{1}{3}$ in. in diam., with a deep groove between the two oblong carpels.—*Baron* 274 ! 965 ! 1019 ! 2177 ! 2213 ! 3137 !

PLECTRONIA (§ CANTHIUM) BOIVINIANA, n. sp.

Arborea, glabra, stipulis parvis deltoideis, foliis breviter petiolatis oblongis acutis subcoriaceis, floribus in umbellas multas axillares paucifloras dispositis, pedicellis calycem floriferum 2–3plo superantibus, calycis tubo

campanulato dentibus minutis deltoideis, corollæ tubo infundibulari segmentis brevibus, fructû duro compresso didymo conspicue emarginato.

A tree, glabrous in all its parts, with slender straight terete branchlets. Leaves moderately firm in texture, 2–3 in. long, deltoid at the base, with distant fine ascending main veins. Flowers 2–4 together from the axils of the leaves all down the branchlets; pedicels finally $\frac{1}{4}$ in. long. Flower-calyx campanulate, $\frac{1}{12}$ in. in diam. Fruit hardy, didymous, compressed, conspicuously emarginate, $\frac{1}{3}$ in. in diam, sometimes one of the carpels aborted.—*Baron* 2942! 3071! Also gathered by Boivin. Allied to the Seychelles *P. acuminata*, Baker.

IXORA EMIRNENSIS, n. sp.

Fruticosa, glabra, stipulis parvis deltoideis, foliis petiolatis oblongis acutis subcoriaceis, floribus in paniculas terminales pedunculatas ramulis corymbosis dispositis, bracteis minutis deltoideis, pedicellis brevissimis, calycis tubo campanulato dentibus deltoideis, corollæ segmentis ovato-lanceolatis parvis tubo cylindrico 4–5plo brevioribus, filamentis brevissimis, fructu globoso magnitudine pisi.

An erect shrub, 10–15 feet high, glabrous in all its parts; with slender terete branchlets. Leaves shortly petioled, 3–4 in. long, 1–1½ in. broad, deltoid at the base, green and glabrous on both sides, with copious fine venation. Panicles terminal, distinctly peduncled, both end and side branches level-topped. Flower-calyx with a campanulate tube $\frac{1}{24}$ in. in diam. and 4 small deltoid teeth. Corolla with a slender cylindrical tube $\frac{1}{2}$ in. long and an expanded limb $\frac{1}{4}$ in. in diam. Stamens shorter than the segments; anthers linear, versatile, $\frac{1}{12}$ in. long; filaments very short. Fruit brown, globose, coriaceous, $\frac{1}{4}$ in. in diam., crowned by the persistent calyx, with one hemispherical seed filling each of the two cells.—*Baron* 1247! 2228! Forest of Andrangaloaka, *Dr. G. W. Parker*! Allied to the Seychelles *I. pudica*, and much inferior in floral effect to *I. odorata*, Hook., which Mr. Baron has twice collected (188! 1444!).

PSYCHOTRIA (§ GRUMILEA) MESENTERICARPA, n. sp.

Glabra vel subglabra, ramulis subcompressis, stipulis deltoideis cuspidatis coriaceis caducis, foliis breviter petiolatis obovatis cuspidatis subcoriaceis, floribus in paniculam terminalem ramulis corymbosis dispositis, pedicellis brevibus, calycis tubo campanulato limbo brevissimo obscure dentato, corollæ tubo infundibulari segmentis ovatis, fructu globoso nigro magnitudine pisi parvi, seminibus sulcatis albumine ruminato.

A tree, with slightly compressed woody glabrous or obscurely pubescent branchlets. Leaves shortly petioled, obovate, deltoid at the base, rounded to a cusp at the apex, 3–4 in. long, firm in texture, green and glabrous on both surfaces, with 8–10 pairs of distinct arcuate-ascending main veins. Flowers in short-peduncled deltoid terminal panicles. Calyx obconic, $\frac{1}{12}$ in. in diam., with a short collar-like limb. Corolla $\frac{1}{6}$ in. long, with 5 small ovate segments. Stamens and style just exserted from the throat of the corolla-tube. Fruit black, globose, $\frac{1}{6}$ in. in diam., crowned by the persistent calyx-limb. Seeds one filling each cell. —*Baron* 851! 1240! 2969! 2995! 3015!

PSYCHOTRIA LUCIDULA, n. sp.

Arborea, glabra, stipulis deltoideis, foliis magnis petiolatis obovato-oblongis cuspidatis subcoriaceis, floribus parvis copiosis in paniculam terminalem ramulis corymbosis dispositis, pedicellis brevibus, bracteis minutis deltoideis persistentibus, calycis tubo campanulato dentibus 5 minutis deltoideis, corollæ tubo infundibulari segmentis ovato-lanceolatis tubo duplo brevioribus, fructu ovoideo glabro brunneo ruguloso, seminibus profunde sulcatis.

A tree, glabrous in all its parts, with slender straight rather compressed branchlets. Leaves opposite, distinctly petioled, 4–6 in. long, 2–2$\frac{1}{2}$ in. broad, deltoid at the base, acute or obtuse, with a cusp at the apex, pale green and quite glabrous on both surfaces, rather glossy beneath, with 9–10 pairs of distinct arcuate-ascending main veins. Flowers in a peduncled broad short end-panicle. Calyx campanulate, $\frac{1}{24}$ in. in diam; teeth minute. Corolla $\frac{1}{8}$ in. long; expanded limb $\frac{1}{8}$ in. in diam., with the stamens just exserted from the throat of the tube. Fruit ovoid, brown, $\frac{1}{6}$ in. long, rather compressed, glabrous, rough, with a distinct groove between the two carpels. Seeds solitary, erect, with the epicarp projecting into five longitudinal furrows down their face.—*Baron* 1285! 2699!

GEOPHILA GERRARDI, n. sp.

G. caulibus filiformibus late reptantibus pubescentibus, foliis longe petiolatis reniformibus facie viridibus glabris dorso glaucescentibus venis pubescentibus, floribus paucis in capitulum terminalem pedunculatum bracteis foliaceis oblongis aggregatis, calycis tubo obconico dentibus minutis deltoideis, corollæ segmentis ovato-lanceolatis tubo infundibulari duplo brevioribus, staminibus segmentis brevioribus.

A herbaceous perennial, with slender wide-trailing pubescent stems. Petiole 1–2½ in. long; stipules simple, deltoid; blade 1–1¼ in. long, moderately firm in texture, nearly as broad as long, furnished with two semicircular basal auricles, bright green and glabrous on the upper surface, whitish beneath, with brown slightly pubescent veins. Flowers several together, sessile in a peduncled terminal head, surrounded by an involucre of distinct imbricated pilose oblong foliaceous bracts ⅙ in. long. Calyx shorter than the bracts, pubescent. Corolla under ¼ in. long, pubescent. Stamens shorter than the corolla-segments; anthers linear-oblong; filaments very short. Fruit not seen.—Gathered long ago by *Gerrard* (102!), and now refound by *Baron* 2444! and *Humblot* 133!

HOLOCARPA, genus novum ordinis Rubiacearum tribus Anthospermearum.

Flores hermaphroditi. Calycis tubus parvus, campanulatus; segmenta 5, raro 6, magna lanceolata foliacea inæqualia. Corolla hypocraterimorpha, tubo cylindrico fauce villosa, segmentis oblongis patulis. Ovarium 3–5-loculare, ovulis in loculo solitariis erectis; stylus elongatus filiformis apice bifidus. Stamina sæpissime 5, infra faucem corollæ tubi inserta, filamentis leviter applanatis, antheris oblongis. Fructus indehiscens, seminibus in loculo solitariis.—Herba perennis Madagascariensis, foliis oppositis subsessilibus obovato-oblongis, stipulis foliaceis, floribus in cymas densas terminales breviter pedunculatas dispositis.

HOLOCARPA VERONICOIDES, *Baker*.

A perennial herb, with the habit of a *Hedyotis* or of *Veronica officinalis*, with short, trailing or spreading, slightly pubescent, slender terete stems. Leaves in opposite pairs, sessile, oblong or oblanceolate-oblong, ½–¾ in. long, obtuse, deltoid at the base, green and glabrous on both surfaces, moderately firm in texture. No veins except the midrib obvious; stipules large, foliaceous, persistent, linear or lanceolate, simple or compound, ciliated. Flowers few together, in congested corymbose peduncled terminal cymes; pedicels none or very short. Corolla ⅛ in. long, with a globose tube; segments lanceolate, foliaceous, unequal. Corolla lilac; tube ¼ in. long, cylindrical downwards, funnel-shaped at the top; segments oblong cuspidate, ⅛ in. long. Stamens about as long as the segments; anthers linear-oblong; filaments a little flattened, longer than the anthers. Style filiform, about as long as the corolla-tube, bifid at the apex. Fruit globose, indehiscent, ⅛ in. in diam., crowded by the large leafy calyx-segments;

cells 3–5, with a single seed in each.—Allied to *Otiophora*, from which it differs by its hermaphrodite, usually pentamerous flowers, corolla-tube villose at the throat, and indehiscent 3–5-celled fruit. It was collected long ago in flower by Dr. Lyall, and has now been refound by Mr. Baron 736! and Dr. Hildebrandt, no. 3848!

VERNONIA POLYTRICHOLEPIS, n. sp.

Fruticosa, ramulis rectis dense pubescentibus, foliis subsessilibus parvis oblongis integris rigide coriaceis facie viridibus obscure pubescentibus dorso persistenter albo-incanis, capitulis parvis 6–8-floris in paniculam ramulis glomerato-corymbosis dispositis, involucro brevi campanulato imbricato bracteis obtusis densissime villosis, achenio piloso, pappo albido setis firmulis persistentibus.

A much-branched shrub, with terete slender branchlets, densely clothed with short whitish pubescence. Leaves about an inch long, nearly sessile, subacute, rounded at the base, green and finally nearly glabrous above, matted beneath with brownish-white persistent tomentum. Panicle terminal, 2–3 in. long and broad, the very numerous sessile heads crowded in clusters at the top of the branches. Involucre campanulate, $\frac{1}{8}$ in. long; bracts obtuse, densely clothed with short whitish woolly pubescence, the outer very small. Corolla $\frac{1}{8}$ in. long; segments very short. Pappus as long as the corolla-tube; bristles firm, persistent, distinctly ciliated.—*Baron* 2337! 2530! Allied to *V. Lyallii*, Baker, in Journ. Linn. Soc. xx. p. 174.

VERNONIA VOLUTA, n. sp.

Fruticosa, volubilis, ramulis gracilibus pubescentibus cito calvatis, foliis petiolatis oblongis acutis integris subcoriaceis facie glabratis dorso brunneo-pubescentibus, capitulis parvis multifloris in paniculas laterales rhachi valde flexuoso ramulis corymbosis dispositis, involucro campanulato piloso bracteis paucis lanceolatis acutis subæquilongis, pappo albo firmulo.

A climber, with slender terete woody stems, clothed at first with short brown pubescence. Leaves 2–3 in. long, acute, rounded at the base, subcoriaceous, green and glabrescent above, coated beneath with persistent brown tomentum. Heads arranged in copious axillary panicles, longer than the leaves, with a very zigzag rhachis, clothed with short tomentum, as are the corymbose spreading or reflexed branches. Involucre campanulate, $\frac{1}{6}$ in. long, pilose, the lanceolate acute brown bracts scarcely more than uniserial. Flowers about 20 in a head. Pappus of white moderately firm bristles.—*Baron* 2375! Allied to *V. apocynifolia,* Baker in Journ. Linn. Soc. xx. p. 175.

VERNONIA STREPTOCLADA, n. sp.

Fruticosa, volubilis, ramulis gracilibus pubescentibus cito calvatis, foliis parvis petiolatis ovatis sæpissime acutis utrinque molliter brunneo-pubescentibus, capitulis parvis multifloris in paniculas laterales vel terminales rhachi brunneo-velutino insigniter flexuoso ramulis corymboso-glomeratis dispositis, involucro brevi campanulato piloso bracteis pauciseriatis rigidis obtusis, achenio glabro, pappo albido ex involucro exserto.

A climber, with terete woody stems, clothed at first with short brown pubescence. Leaves 1–1½ in. long, nearly as broad as long, rounded at the base, rarely obtuse, not at all rigid in texture, coated on both sides with soft brown pubescence. Heads arranged in panicles, with a very zigzag pubescent rhachis, the lower branches reflexed. Involucre ⅛ in. long; bracts all rigid and obtuse. Flowers 20 or more in a head. Achene glabrous; pappus of moderately firm persistent whitish bristles, ⅛ in. long.—*Baron* 3041! 3076! *Dr. Parker*! Allied to *V. voluta* and *V. apocynifolia.*

VERNONIA (§ DISTEPHANUS) TRICHANTHA, n. sp.

Fruticosa, ramulis rectis dense incanis sursum villosis, foliis parvis subsessilibus oblongis integris coriaceis trinervatis utrinque albido-incanis, capitulis paucis multifloris corymbosis glomeratis, involucro magno campanulato bracteis pauciseriatis adpressis lanceolatis dense albido-incanis, floribus extus apice villosis, achenio piloso, pappo rigidulo pulchre rubello.

A shrub, with slender straight woody branchlets, clothed with thin persistent whitish tomentum, or towards the top with thicker, looser pubescence. Leaves thick and rigid in texture, not crowded, 1–1½ in. long, three-nerved nearly from the base to the tip, matted on both sides with whitish tomentum. Heads few, crowded in dense terminal corymbs. Involucre campanulate, nearly ½ in. in diam.; bracts lanceolate, acute, adpressed, densely clothed with white arachnoid pubescence. Corolla ⅙ in. long, densely villose outside towards the tip; segments oblong-lanceolate, ¼ as long as the tube. Pappus pale scarlet, rigid, as long as the corolla-tube.—*Baron* 607! Allied to *V. ochroleuca* and *V. inulæfolia,* Baker in Journ. Linn. Soc. xx. pp. 179, 180.

APODOCEPHALA, genus novum Compositarum tribus Eupatoriacearum.

Capitula homogama 3–4-flora, floribus omnibus tubulosis hermaphroditis. Involucrum oblongum, bracteis 10–12 rigidis adpressis, exterioribus sensim brevioribus, extimis ovatis, intimis oblongis. Receptaculum nudum. Corollæ æquales, regulares, tubo cylindrico glanduloso, segmentis oblongo-lanceolatis tubo æquilongis. Antheræ apice connectivo dilatato deltoideo appendiculatæ, basi auriculis acutis præditæ. Stylus profunde bifidus, ramis falcatis linearibus obtusis ad basin stigmatosis. Achenia linearia, angulata, glabra, apice cupulo obscuro solum coronata; pappus nullus.—Frutex Madagascariensis, ramulis robustis lignosis, foliis alternis petiolatis oblongis subcoriaceis dorso pubescentibus, capitulis permultis parvis glomeratis in paniculam amplam latam dispositis.

APODOCEPHALA PAUCIFLORA, *Baker.*

A large shrub, with the habit of a *Vernonia* or *Eupatorium*, with stout terete woody branchlets. Leaves oblong acute, rounded at the base, 4–5 in. long, subcoriaceous in texture, green, glabrous and rather lucent above, clothed with persistent short brown pubescence beneath, with 10–12 distinct often forking pairs of rather ascending main veins; petiole above an inch long. Panicle terminal, 6–8 in. long and broad, the woody branches clothed with short brown pubescence. Capitula glomerate in dense congested corymbs at the end of the branchlets, sessile. Involucre $\frac{1}{6}$ in. long; bracts drab-brown, rigid, the outer growing gradually smaller. Achene glabrous, $\frac{1}{8}$ in. long, strongly angled, dilated into an obscure cup without any bristles or paleæ at the apex. Corolla $\frac{1}{8}$ in. long, with a cylindrical glandular tube and 5 oblong-lanceolate segments as long as the tube. Stamens and style much shorter than the corolla-segments.—*Baron* 3251! Allied to *Ageratum* and *Carelia.*

HELICHRYSUM LEUCOSPHÆRUM, n. sp.

Herbaceum, perenne, ramulis foliisque persistenter albo-incanis, foliis sessilibus lanceolatis integris erectis uninerviis, capitulis parvis sessilibus paucifloris in glomerulum globosum terminalem aggregatis, involucro infundibulari bracteis pauciseriatis lanceolatis erectis adpressis acutis, pappo albido.

A perennial herb, with slender erect stems coated with persistent white tomentum. Leaves sessile, erect, crowded, lanceolate, 1–1$\frac{1}{2}$ in. long, tapering to a point, coated on both sides with persistent tomentum like that of the stem. Heads very numerous, small, sessile, aggregated in globose terminal clusters $\frac{1}{2}$–$\frac{3}{4}$ in. in diam. Involucre $\frac{1}{6}$ in. long, villose at the base, composed of a few rows of pure white rigid erect bracts of moderately firm texture. Pappus of white bristles.—*Baron* 2611!

HELICHRYSUM XYLOCLADUM, n. sp.

Fruticosum, ramulis lignosis albido-tomentosis, foliis parvis oblongis obtusis coriaceis integris sessilibus facie tenuiter dorso dense albido-tomentosis, capitulis 6–7-floris in paniculam amplam latam ramulis divaricatis dispositis, involucro magno obconico multiseriali albido-tomentoso, bracteis apice scarioso patulo orbiculari præditis, pappo albido.

A shrub, with straight woody branchlets clothed with persistent whitish tomentum. Leaves under an inch long, obtuse, cuneate at the base, very thick and rigid in texture, clothed thinly above and more densely beneath with whitish persistent tomentum like that of the stem. Capitula very numerous, arranged in a panicle 6–8 in. long and broad, with divaricated corymbose branches. Involucre $\frac{1}{4}$–$\frac{1}{3}$ in. long, tomentose in the lower part; all the bracts rigid downwards, furnished with a spreading chartaceous white orbicular tip, the outer ones gradually shorter. Receptacle flat, very small. Pappus of white ciliated bristles.—*Baron* 3268! 3324!

MELANTHERA MADAGASCARIENSIS, n. sp.

Herbacea, sarmentosa, ramulis gracilibus hispidis, foliis petiolatis lanceolatis membranaceis utrinque hispidulis, capitulis radiatis laxe corymbosis, pedunculis pedicellisque erectis elongatis, involucro brevi campanulato bracteis subæquilongis lanceolatis, ligulis fœmineis, achænio obconico angulato apice truncato setis pluribus fragilibus coronato.

A sarmentose perennial herb, with slender angled slightly hispid stems. Leaves opposite, 3–4 in. long, obscurely dentate, cordate or truncate at the base, green and scabrous above, pale green and more hispid beneath; petiole $\frac{1}{4}$–$\frac{1}{2}$ in. long. Heads arranged in a very lax corymb on long slender erect peduncles and pedicels. Unexpanded heads globose, $\frac{1}{3}$ in. in diam., with the rigid ovate-lanceolate paleæ of the receptacle exceeding the young corollas. Involucre broadly campanulate, $\frac{1}{3}$ in. in diam., $\frac{1}{8}$ in. long; bracts lanceolate, subequal, almost foliaceous, very hispid. Ligules 15–20, bright yellow, $\frac{1}{3}$ in. long, with a perfect style but no stamens. Achene angled, truncate at the apex, $\frac{1}{16}$ in. long; bristles 6–10, fragile, caducous, as long as the achene.—*Baron* 2344! 2534! *Humblot* 410! A new genus for the island. Three species are known in Tropical Africa.

Senecio purpureo-viridis, n. sp.

Fruticosus, ramulis gracilibus pubescentibus, foliis multis sessilibus amplexicaulibus lyrato-panduræformibus profunde inciso-crenatis medio cito angustatis basi auriculatis facie viridibus glabratis dorso purpureis pubescentibus, capitulis paucis magnis corymbosis ligulatis, involucro campanulato bracteis lanceolatis, ligulis luteis, achenio glabro, pappo firmulo albo.

A shrub, with long slender straight copiously leafy pubescent branchlets. Leaves moderately firm in texture, $1\frac{1}{2}$–2 in. long, the oblong obtuse deeply-toothed upper half $\frac{1}{2}$ in. broad, narrowed suddenly halfway down into a repand wing to the midrib, which is dilated at the base into 2 round amplexicaul auricles. Heads few, arranged in a terminal corymb; peduncles ascending, pubescent, their upper leaves reduced to minute entire lanceolate bracts. Involucre campanulate, $\frac{1}{3}$ in. in diam.; bracts about 12, pubescent on the back. Ligules $\frac{1}{3}$ in. long. Disk-flowers very numerous. Achene glabrous, $\frac{1}{16}$ in. long. Pappus $\frac{1}{4}$ in. long; bristles pure white, ciliated, firm in texture for the genus.—*Baron* 3264! Nearest *S. adenodontus*, of the species described in the 'Prodromus.'

Ardisia myriantha, n. sp.

Arborea, foliis breviter petiolatis oblanceolato-oblongis obtusis glabris rigide coriaceis venulis subtilibus, floribus in paniculas axillares breviter pedunculatas ramulis racemosis divaricatis dispositis, pedicellis brevibus pubescentibus, bracteis minutis deltoideis, calycis tubo brevissimo segmentis orbicularibus imbricatis, corollæ tubo brevissimo segmentis orbicularibus, antheris parvis subsessilibus.

An erect shrub or small tree. Leaves 4–5 in. long, 1–$1\frac{1}{2}$ in. broad, narrowed gradually from the middle to the base, thick and rigid in texture, the veins fine and indistinct. Panicles shorter than the leaves; branches few and spreading; rhachises finely pubescent; pedicels at most as long as the flowers; bracts minute, persistent. Expanded calyx $\frac{1}{16}$ in. in diam.; segments 5, orbicular, much imbricated. Corolla $\frac{1}{12}$ in. long. Anthers not more than half as long as the corolla-segments. Ovary orbicular; style very short. Fruit not seen.—*Baron* 2312! Nearly allied to *A. bipinnata*, Baker, in Journ. Linn. Soc. xx. p. 201.

Ardisia oligantha, n. sp.

Fruticosa, glabra, ramulis gracilibus, foliis parvis oblongis subobtusis breviter petiolatis subcoriaceis, floribus in corymbos axillares pedunculatos paucifloros dispositis, pedicellis elongatis, bracteis minutis, calycis tubo

brevissimo segmentis ovatis, corollæ tubo brevissimo segmentis orbicularibus, antheris ad faucem tubi sessilibus.

A shrub, glabrous in all its parts, with very slender branchlets. Leaves $\frac{3}{4}$–$1\frac{1}{4}$ in. long, deltoid at the base, moderately firm in texture, green and glabrous on both surfaces, the veins fine and immersed; petiole $\frac{1}{12}$–$\frac{1}{8}$ in. long. Corymbs 2–3-flowered, about as long as the leaves; pedicels very slender, $\frac{1}{4}$–$\frac{1}{3}$ in. long. Expanded calyx $\frac{1}{12}$ in. in diam.; spreading segments twice as long as the tube. Corolla $\frac{1}{12}$ in. long. Anthers deltoid, half as long as the corolla-segment. Ovary globose; style short. Fruit not seen.—*Baron* 2918!

ARDISIA? MACROSCYPHA, n. sp.

Fruticosa, glabra, ramulis gracilibus teretibus, foliis subsessilibus oblongis obtusis subcoriaceis, floribus axillaribus solitariis, pedicellis elongatis, calycis tubo campanulato segmentis ovatis, corollæ tubo oblongo segmentis semiorbicularibus tubo brevioribus, antheris magnis acutis prope basin corollæ tubi insertis.

An erect shrub, glabrous in all its parts, with slender subterete branchlets. Leaves obscurely petioled, $1\frac{1}{2}$–2 in. long, firm in texture, green and glabrous on both surfaces, with fine indistinct veining. Flowers in the only specimen seen solitary from the axils of the upper leaves on slender ascending pedicels above an inch long, articulated above the middle. Calyx $\frac{1}{12}$ in. in diam.; segments broad ovate, obtuse, ciliated, twice as long as the tube. Corolla $\frac{1}{6}$ in. long, with 5 semiorbicular segments, not more than half as long as the tube. Anthers $\frac{1}{8}$ in. long, inserted low down in the corolla-tube. Ovary globose; style cylindrical, $\frac{1}{16}$ in. long.—*Baron* 2278! Differs from *Ardisia* by its short corolla-lobes and stamens inserted low down in the corolla-tube, and may perhaps claim to be considered a new genus.

ARDISIA UMBELLATA, n. sp.

Fruticosa, glabra, foliis oblongis acutis breviter petiolatis subcoriaceis, floribus in cymas axillares paucifloras pedunculatas dispositis, pedicellis elongatis, calycis segmentis ovatis tubo campanulato æquilongis, corollæ tubo brevissimo segmentis orbicularibus cuspidatis, antheris parvis ovatis ad faucem tubi pæne sessilibus.

An erect much-branched shrub, glabrous in all its parts, with slender subterete branchlets. Leaves 2–3 in. long, deltoid at the base, moderately firm in texture, green and glabrous on both surfaces, the veins fine and indistinct. Flowers 2–6 in copious axillary umbels; pedicels $\frac{1}{4}$ in. long; peduncles very slender, shorter than the leaves. Calyx $\frac{1}{12}$ in. in diam.; segments 5, obtuse. Corolla $\frac{1}{8}$ in. long; segments much imbricated in bud, copiously black-dotted. Stamens less than half as long as the corolla-segments. Ovary globose; style cylindrical, as long as the ovary. Fruit not seen.—*Baron* 2938!

ARDISIA LONGIPES, n. sp.

Fruticosa, glabra, foliis petiolatis obovato-oblongis obtusis subcoriaceis, floribus in racemos laxos pedunculatos dispositis, pedicellis elongatis, calycis tubo brevi segmentis ovatis obtusis, corollæ tubo brevissimo segmentis orbicularibus cuspidatis, antheris ad faucem corollæ tubi subsessilibus.

An erect much-branched shrub, glabrous in all its parts, with slender subterete branchlets. Leaves 2–3 in. long, 1–1½ in. broad, narrowed gradually from the middle to a deltoid base, moderately firm in texture, green and glabrous on both surfaces, the veins fine and immersed. Flowers in copious racemes, sometimes congested into corymbs, from the axils of the leaves, on slender peduncles 1–1½ in. long; pedicels ascending, $\frac{1}{3}$–$\frac{1}{2}$ in. long; bracts 0, or very minute. Expanded calyx rotate, $\frac{1}{8}$ in. in diam. Corolla $\frac{1}{8}$ in. long; segments much imbricated. Stamens half as long as the corolla-segments. Style cylindrical, as long as the globose ovary. Fruit not seen.—*Baron* 2224!

ONCOSTEMUM PLATYCLADUM, n. sp.

Fruticosum, glabrum, ramulis compressis acute ancipitibus, foliis brevissime petiolatis oblongis acutis subcoriaceis utrinque viridibus, floribus in corymbos paucifloros breviter pedunculatos dispositis, pedicellis elongatis, calycis et corollæ tubo brevissimo segmentis orbicularibus, filamentis in urceolum parvum ampullæforme ore angusto coalitis.

An erect shrub, glabrous in all its parts, with remarkably flattened acutely-angled branchlets. Leaves 3–4 in. long, narrowed gradually from the middle to both ends, moderately firm in texture, bright green on both surfaces, with fine immersed veins. Flowers about three to a corymb; peduncle short, ancipitous; bracts none; pedicels very slender, $\frac{1}{4}$–$\frac{1}{3}$ in. long. Expanded calyx $\frac{1}{8}$ in. in diam. Expanded corolla $\frac{1}{6}$ in. in diam. Staminal urceolus not more than half as long as the corolla; the anthers, ovary, and style included inside it. Fruit not seen.—*Baron* 2882!

ONCOSTEMUM NERIIFOLIUM, n. sp.

Fruticosum, glabrum, ramulis teretibus, foliis petiolatis oblanceolato-

oblongis obtusis rigide coriaceis, floribus in corymbos axillares pedunculatos dispositis, pedicellis elongatis, calycis tubo brevi segmentis orbicularibus, corollæ tubo brevissimo segmentis orbicularibus, filamentis in urceolum fauce breviter lobata connatis.

An erect shrub or small tree, glabrous in all its parts. Branchlets terete, straight, not very slender. Leaves 3–4 in. long, $\frac{3}{4}$–$1\frac{1}{4}$ in. broad above the middle, narrowed gradually from the middle to the base, very thick and rigid in texture, green and glabrous on both surfaces, the veins fine, crowded, slightly raised. Corymbs usually shorter than the leaves, 4–8-flowered; pedicels $\frac{1}{4}$–$\frac{1}{2}$ in. long; bracts 0. Expanded calyx $\frac{1}{12}$ in. in diam. Corolla $\frac{1}{12}$ in. long. Filaments united in a globose urceolus half as long as the corolla-segments, inside which the stamens, ovary, and style are included. Fruit not seen.—*Baron* 3036!

ONCOSTEMUM VENULOSUM, n. sp.

Arbusculum, glabrum, ramulis gracilibus teretibus, foliis breviter petiolatis oblanceolato-oblongis acutis subcoriaceis utrinque viridibus venulis exsculptis, floribus in corymbos paucifloros pedunculatos axillares dispositis, pedicellis elongatis, calycis tubo brevissimo segmentis orbicularibus imbricatis, corollæ tubo brevissimo segmentis ovatis, filamentis in tubo brevi lato segmentis rotundatis coalitis.

An erect shrub, glabrous in all parts, with slender branches not at all flattened. Leaves 2–3 in. long, $\frac{3}{4}$–1 in. broad, narrowed from the middle to base, firm in texture, bright green on both surfaces, all the veins and veinlets distinctly raised; petiole $\frac{1}{8}$–$\frac{1}{4}$ in. long. Flowers 2–4 in a corymb; peduncle about an inch long; pedicels $\frac{1}{2}$–$\frac{3}{4}$ in.; bracts absent. Calyx $\frac{1}{8}$ in. in diam., very much dotted with black; segments orbicular, broader than long. Corolla $\frac{1}{8}$ in. long, very much dotted with black. Staminal urceolus less than half as long as the corolla-segments, with rounded lobes, the acute tips of the anthers protruding from its open throat. Ovary globose; style short, cylindrical; stigma capitate. Fruit not seen.—*Baron* 2986! 2997! Andrangaloaka, *Hildebrandt* 4083!

DIOSPYROS FUSCO-VELUTINA, n. sp.

Arborea, ramulis virgatis glabris, foliis brevissimè petiolatis oblongis magnis rigide coriaceis lucidis, pedicellis brevissimis lateralibus solitariis, calyce fructifero segmentis 5 ovatis crassis rigide coriaceis utrinque fusco-velutinis, fructu globoso cuspidato dense persistenter fusco-velutino calyci æquilongo.

A tree, with wand-like glabrous dark rather shining chestnut-brown branchlets. Leaves 6–8 in. long, about 3 in. broad, acute, rounded at the base, very thick and rigid in texture, glossy above, with 10–12 pairs of distinct erecto-patent raised main veins, uniting in arches before they reach the margin. Pedicels stout, solitary, densely pilose, ¼–½ in. long. Fruit-calyx campanulate, 1–1¼ in. in diam., thick and rigid in texture, densely brown-velvety both inside and out; spreading tube ½ in. long; segments ovate, acute, ¾ in. long and broad. Fruit woody in texture, ¾ in. in diam., densely brown-velvety, like the calyx.—*Baron* 2361!

DIOSPYROS MEGASEPALA, n. sp.

Arborea, glabra, foliis petiolatis magnis oblongis acutis rigide coriaceis, pedicellis lateralibus longissimis fastigiatis gracilibus interdum furcatis, calyce fructifero segmentis 4 late ovatis acutis magnis rigide coriaceis, fructu glabro ovoideo cuspidato magnitudine nucis juglandis.

An erect tree, glabrous in all its parts, with terete branchlets ¼–⅓ in. in diam. Leaves nearly a foot long, 3–4 in. broad, rounded at the base, rigid in texture, dark drab on both sides in the dried state, with distant arcuate-ascending main veins, connected by fine raised cross veinlets. Flowers in a cluster from the side of thick branchlets; pedicels 5–6 in. long, slender, thickened upwards, in one instance forked. Fruit-calyx 2½ in. in diam., rigidly coriaceous in texture, drab, marked with copious raised anastomosing veins; united portion an inch long; segments 4, about 2 in. long and broad, covered with white meal inside. Fruit woody in texture, mealy, above an inch long, quite hidden by the large calyx.—*Baron* 2365!

DIOSPYROS SPHÆROSEPALA, n. sp.

Fruticosa, glabra, ramulis ultimis ancipitibus, foliis sessilibus oblongis rigide coriaceis, floribus fœmineis solitariis lateralibus brevissime pedunculatis, calycis tubo brevissimo segmentis 4 orbicularibus obtusis glabris coriaceis, corollæ tubo campanulato segmentis 4 ovatis, ovario glabro.

A much-branched erect shrub or small tree, glabrous in all its parts, with acutely-angled branchlets. Leaves 2–3 in. long, deltoid at the base, rigid in texture, green and glabrous on both surfaces, the main veins fine and erecto-patent. Female flowers solitary, lateral; pedicels very short, with 2–3 minute ovate obtuse bracts. Flower-calyx ½ in. in diam., with a short spreading tube and 4 glabrous coriaceous brown veinless suborbicular obtuse segments. Corolla shorter than the calyx; segments 4, ovate, twice as long as the tube. Fruit not seen.—*Baron* 2308!

DIOSPYROS GONOCLADA, n. sp.

Fruticosa, glabra, ramulis ancipitibus, foliis sessilibus oblongis obtusis rigide coriaceis, floribus fœmineis in cymas axillares 3–4-floras dispositis, pedicellis brevibus pilosis, calycis parvi segmentis 4 ovatis acutis, corollæ tubo brevi segmentis ovatis.

An erect shrub, with slender glabrous branchlets, acutely angled towards the tip. Leaves alternate, rigid in texture, 2–3 in. long, deltoid at the base, green on both surfaces, with distant fine arcuate-ascending anastomosing main veins. Flowers 3–4 in lateral cymes, with very short peduncles and pedicels; bracts minute, lanceolate. Flower-calyx campanulate, glabrous, $\frac{1}{6}$ in. long, with 4 ovate acute segments 2–3 times as long as the tube. Corolla $\frac{1}{3}$ in. long, glabrous; segments 4, ovate, twice as long as the tube. Fruit not seen.—*Baron* 2313!

Of all these four new Ebonies we have only the pistillate plants, two of them in the flowering and two in the fruiting stage, so that much further material is wanted for a thorough knowledge of their characters.

HOLARRHENA? MADAGASCARIENSIS, n. sp.

Volubilis, fruticosa, glabra, foliis subsessilibus obovato-oblongis subcoriaceis cuspidatis, floribus in cymas umbellatas paucifloras axillares dispositis, pedicellis cernuis, calycis tubo campanulato segmentis ovatis, corollæ tubo cylindrico segmentis oblongis tubo duplo brevioribus, staminibus supra medium tubi insertis, folliculis cylindricis rigidis patulis.

A woody climber, glabrous in all its parts. Leaves opposite, almost sessile, 2–3 in. long, about an inch broad, rounded at the apex to a large cusp, narrowed gradually from the middle to the base, moderately firm in texture, green and glabrous on both surfaces, with 5–6 pairs of erecto-patent main veins. Flowers 3–6 in umbellate cymes in the axils of the upper leaves; pedicels $\frac{1}{4}$–$\frac{1}{3}$ in. long. Calyx $\frac{1}{6}$ in. long, the ovate segments twice as long as the tube. Corolla with a cylindrical tube $\frac{1}{3}$ in. long and 5 oblong segments half as long as the tube. Anthers lanceolate-deltoid, inserted above the middle of the corolla-tube, on short broad filaments. Follicles woody in texture, 5 in. long, spreading at a right angle from the top of the peduncles. Seeds with a coma of soft hairs nearly an inch long.—*Baron* 3242! Differs from *Holarrhena* in the insertion of the stamens.

Adenoplusia axillaris, Radlkofer, in Bremen Abhand. viii. 461, founded on *Hildebrandt* 3671 = *Buddleia axillaris*, Willd.; Baker in Journ. Linn. Soc. xx. p. 206; *Baron* 1481 and 1980.

BUDDLEIA SPHÆROCEPHALA, n. sp.

Fruticosa, ramulis albido-tomentosis, foliis verticillatis breviter petiolatis oblanceolato-oblongis dentatis subcoriaceis dorso tenuiter tomentosis, floribus in capitulos globosos racemosos aggregatis, calycis segmentis brevissimis, corollæ tubo infundibulari segmentis parvis deltoideis, bracteis rigidis obtusis, fructu oblongo-clavato apice piloso.

An erect shrub, 6 or 7 feet high, with the branchlets coated with whitish tomentum towards the tips. Leaves crowded, ascending, mostly three in a whorl, 3–4 in. long, 1–$1\frac{1}{2}$ in. broad above the middle, obtuse or subacute, narrowed gradually from the middle to the base, rigid in texture, glabrescent above, thinly coated with whitish tomentum beneath; veins 5–6-jugate, raised, arcuate-ascending. Heads globose, $\frac{1}{2}$–$\frac{3}{4}$ in. in diam., few or many in a short terminal raceme. Bracts oblanceolate, oblong, obtuse, rigidly coriaceous, navicular, pilose inside and out. Capsule clavate, $\frac{1}{12}$–$\frac{1}{8}$ in. long, splitting into two emarginate rigid valves. —*Baron* 2239! 3111! Also on clay soil, at Maromanga, at 4000 ft., between Tamatave and Antananarivo, *Dr. Meller*! Allied to the well-known *B. globosa*, Lam.

GAERTNERA PHANEROPHLEBIA, n. sp.

Fruticosa, ramulis fusco-pilosis, stipulis membranaceis vaginantibus, foliis breviter petiolatis oblongis acutis ciliatis venis erecto-patentibus pilosis, floribus in cymas congestas terminales dispositis, calycis segmentis magnis lanceolatis, corollæ tubo subcylindrico piloso, segmentis brevibus oblongis, fructu parvo globoso glabro.

An erect shrub, with slender branchlets, densely clothed upwards with soft brown spreading hairs. Stipules $\frac{1}{2}$ in. long. Leaves 3–4 in. long, about an inch broad, rounded at the base, moderately firm in texture, with 8–12 pairs of raised parallel erecto-patent veins, clothed with adpressed brown hairs. Flowers in small globose sessile terminal heads. Calyx finally $\frac{1}{4}$–$\frac{1}{3}$ in. long, with a small campanulate tube and 5 large pilose lanceolate segments. Corolla $\frac{1}{2}$ in. long, the oblong spreading segments not more than $\frac{1}{3}$–$\frac{1}{4}$ as long as the subcylindrical pilose tube. Fruit small, globose, glabrous.—*Baron* 2372! 2982!

GAERTNERA PHYLLOSTACHYA, n. sp.

Fruticosa, glabra, stipulis magnis vaginantibus, foliis breviter petiolatis oblanceolato-oblongis acutis subcoriaceis glabris, floribus in paniculam amplam ramulis corymbosis dispositis, bracteis multis magnis foliaceis persistentibus, calyce subtruncato, corollæ tubo subcylindrico, segmentis oblongis tubo brevioribus, fructu parvo globoso glabro.

A shrub or small tree, glabrous in all its parts. Stipules membranous, $\frac{1}{2}$–1 in. long. Leaves 4–5 in. long, $1\frac{1}{4}$–$1\frac{1}{2}$ in. broad, deltoid at the base, moderately firm in texture, green and glabrous on both surfaces, with distant fine arcuate-ascending main veins. Flowers in a lax deltoid terminal panicle 3–4 in. long and broad, with corymbose branches, mixed with copious oblong or lanceolate acute persistent foliaceous bracts $\frac{1}{2}$–1 in. long. Calyx campanulate, $\frac{1}{12}$ in. long, with an obscurely ciliated subentire collar-like limb. Corolla above $\frac{1}{2}$ in. long. Fruit globose, glabrous, $\frac{1}{4}$ in. in diam.—*Baron* 2327! 2683! Also *Humblot* 510!

IPOMÆA (§ ANISEIA) PHYLLONEURA, *Baker*.

Herbacea, volubilis, ramulis pilosis, foliis petiolatis ovato-hastatis membranaceis glabris, floribus axillaribus sæpe solitariis, bracteis foliaceis persistentibus, calycis segmentis magnis inæqualibus cordato-ovatis cuspidatis acute carinatis basi dentatis, corollæ tubo calyci æquilongo limbo late infundibulari tubo æquilongo, fructu globoso calyce breviori.—Aniseia hastata, *Meisn., in Mart. Fl. Bras.* vii. 319.

Baron 2516! 2605! 2671! This is a Brazilian species, and Mr. Baron's specimens quite agree with those gathered in Brazil by Burchell. I have changed the specific name because *Aniseia* is merged in *Ipomæa* by Bentham and Hooker, and there is already an *Ipomæa hastata* of Linnæus, which = *Quamoclit sagittæfolia* of Choisy.

SOLANUM MYOXOTRICHUM, n. sp.

Fruticosum, ramulis aculeatis densissime ferrugineo-hispidis, foliis petiolatis ovatis acutis utrinque molliter pubescentibus costa aculeata, cymis sessilibus 2–3-floris, pedicellis elongatis hispidis aculeatis, calycis segmentis ovatis acuminatis, corollæ segmentis deltoideis tubo longioribus, antheris magnis.

A much-branched erect shrub, with stems armed with copious small brown prickles and very dense spreading bright brown bristly hairs. Leaves shortly petioled, about 2 in. long, acuminate, subentire, broadly rounded at the base, dull green above, whitish beneath, softly pubescent on both surfaces, the midrib armed with several large pungent brown prickles. Pedicels 1–$1\frac{1}{4}$ in. long, armed with copious bristles and aciculi. Calyx $\frac{1}{2}$ in. long, prickly and very pubescent. Expanded corolla 1 in. in diam. Anthers $\frac{1}{6}$ in. long. Style protruded beyond the anthers. Berry not seen.—*Baron* 1005! 2805! Allied to *S. indicum*, Linn.

SOPUBIA STRICTA, n. sp.

Herbacea, pubescens, caule stricto inferne simplici superne ramosissimo ramulis ascendentibus virgatis, foliis oppositis sessilibus linearibus uninerviis, floribus oppositis laxissime racemosis, pedicellis fructui æquilongis, calycis tubo campanulato segmentis deltoideis, corollæ tubo infundibulari segmentis latis, fructu globoso magnitudine pisi.

A perennial herb, with a stiffly erect pubescent stem about 2 ft. long, much branched in the upper half, the branchlets long, simple, ascending. Leaves in opposite pairs, invariably simple, $\frac{1}{2}$–1 in. long, ascending, one-nerved, with revolute margins. Racemes sometimes half a foot long, the flowers in pairs on short ascending pedicels, bracteated at the base by reduced leaves. Calyx $\frac{1}{6}$ in. long and broad; teeth rather shorter than the tube. Corolla not well seen. Fruit black, glabrous, $\frac{1}{6}$ in. in diam., splitting down nearly to the base into two valves.—*Baron* 2709!

UTRICULARIA IBARENSIS, n. sp.

Limosa, parva, aphylla, caule gracili brevi, racemis laxe 2–3-floris, floribus purpurascentibus, pedicellis brevibus, bracteis 2–3nis acutis, calycis labiis oblongis, corollæ labio postico parvo erecto, antico magno latissimo cuneato, calcare deltoideo.

Stem leafless, very slender, straight, erect, 2–3 in. long. Flowers 2–3, arranged in a lax terminal raceme; pedicels erecto-patent, $\frac{1}{12}$–$\frac{1}{8}$ in. long; bracts minute, lanceolate, persistent. Calyx $\frac{1}{8}$ in. long, slit down nearly to the base into two oblong lips. Upper lip of the corolla deltoid-cuneate, $\frac{1}{8}$–$\frac{1}{6}$ in. long and broad; lower lip considerably broader than long ($\frac{5}{8}$–$\frac{3}{4}$ in. broad), rounded at the apex, cuneate at the base; spur half as long as the lower lip.—Ibara country, *L. Kitching*! Allied to *U. spartea*, Baker, in Journ. Linn. Soc. xx. 216.

DIDYMOCARPUS VESTITA, n. sp.

Annua, pilosa, foliis ovatis petiolatis membranaceis serratis, pedunculis axillaribus 2–3-floris, pedicellis elongatis, calycis tubo brevissimo segmentis lanceolatis, corollæ tubo late infundibulari segmentis brevibus semiorbicularibus, genitalibus inclusis, fructu cylindrico piloso.

An erect annual, with densely pubescent flexuose stems 3–4 in. long. Leaves opposite, 1–2 in. long, obtuse, membranous, densely hairy on both surfaces, inciso-crenate. Flowers in cymes from the axils of the upper leaves; peduncle about an inch long; pedicel finally $\frac{1}{4}$–$\frac{1}{3}$ in., erecto-patent. Calyx campanulate, pilose, $\frac{1}{12}$ in. long, cut down nearly to the base into 5 lanceolate segments. Corolla $\frac{1}{3}$ in. long; segments not more than $\frac{1}{4}$ as long as the tube. Capsule 1 in. long, pilose, narrowed gradually into a curved style $\frac{1}{8}$ in. long; stigma capitate.—*Baron* 2655!

COLEA PARVIFLORA, n. sp.

Fruticosa, erecta, glabra, foliis longe petiolatis foliolis 1–5 oblongis coriaceis pinninerviis, floribus in cymas axillares paucifloras dispositis, pedicellis brevibus, calycis tubo obconico segmentis brevissimis, corollæ pilosæ tubo infundibulari segmentis brevibus oblongis, genitalibus inclusis, fructu oblongo acuto.

An erect much-branched shrub, with glabrous terete branchlets. Petiole sometimes an inch long. Leaves rarely simple, usually compound, with 3–5 oblong obtuse coriaceous leaflets 1–1$\frac{1}{2}$ in. long, green and glabrous on both surfaces, rather glossy above, with 5–6 pairs of distinct parallel arcuate ascending main veins. Flowers few together in shortly-peduncled axillary cymes from the leafy branchlets. Calyx $\frac{1}{8}$–$\frac{1}{6}$ in. in diam., glabrous, with small deltoid segments. Corolla $\frac{5}{8}$ in. long, pilose, with a funnel-shaped tube and small obtuse segments. Stamens not reaching the tip of the perianth-segments. Capsule glabrous, smooth, 1$\frac{1}{2}$ in. long, narrowed to the point—*Baron* 3099!

THUNBERGIA CONVOLVULIFOLIA, n. sp.

Volubilis, glabra, foliis breviter petiolatis cordato-ovatis acutis, floribus axillaribus solitariis, pedicellis elongatis, bracteis oblongis foliaceis persistentibus, calycis dentibus lanceolatis, corollæ tubo deorsum cylindrico sursum oblongo ventricoso, segmentis parvis orbicularibus, genitalibus in tubum inclusis, fructu globoso longe cuspidato.

A climber, with slender shrubby angled stems. Leaves 1–1$\frac{1}{2}$ in. long, moderately firm in texture, turning blackish when dried, with an open basal sinus and rounded auricles; petiole $\frac{1}{6}$–$\frac{1}{3}$ in. long. Flowers solitary from the axils of the leaves on ascending peduncles about an inch long. Bracts $\frac{1}{2}$ in. long, similar to the leaves in colour and texture. Calyx with a very short patellæform tube and 10 rigid erect teeth $\frac{1}{12}$ in. long. Corolla $\frac{3}{4}$ in. long, the ventricose upper part of the tube $\frac{1}{3}$ in. in diam.; segments purplish black, $\frac{1}{8}$–$\frac{1}{6}$ in. long and broad. Capsule globose, $\frac{1}{3}$ in. in diam., with a beak nearly $\frac{1}{2}$ in. long.—*Baron* 2923! Nearly allied to *T. angulata*, Hils. and Bojer, of which there is a figure in Hooker's 'Exotic Flora,' tab. 166.

RUELLIA BREVICAULIS, n. sp.

Herbacea, perennis, pilosa, caulibus brevibus, foliis parvis sessilibus oblanceolato-oblongis obtusis vel subacutis, floribus solitariis axillaribus,

pedicellis brevibus, bracteolis oblongo-lanceolatis persistentibus, calycis tubo infundibulari segmentis lanceolato-deltoideis, corollæ tubo cylindrico pollicari, segmentis orbicularibus patulis, genitalibus in corollæ tubo inclusis.

A herbaceous perennial, copiously branched at the crown of the root, with slender ascending pubescent stems 2–3 in. long. Leaves opposite, sessile, ½ in. long, narrowed from the middle to the base, moderately firm in texture, dark green and hispid on both surfaces. Flowers solitary in the axils of the leaves all down the stem on short ascending pedicels. Calyx ⅓ in. long, green, pilose; segments ¼ the length of the tube. Corolla with a slender cylindrical tube an inch long, only dilated very slightly at the top; segments 5, orbicular-cuneate, subequal, ½ in. long and broad. Stamens 4, inserted near the top of the corolla-tube; filaments short. Capsule not seen.—*Baron* 1896!

JUSTICIA (§ ANISOSTACHYA) TRICHOPHYLLA, n. sp.

Fruticosa, ramulis dense pilosis, foliis longe petiolatis oblongis acutis membranaceis utrinque pilosis, floribus in spicas paniculatas terminales dispositis, bracteis magnis membranaceis obovato-cuneatis persistentibus, calycis tubo brevissimo segmentis oblanceolatis acutis, capsulæ valvis bracteæ æquilongis.

A shrub, with slender branchlets, densely pubescent towards the tip. Leaves 3–4 in. long, membranous, dark green, acuminate, rounded at the base, pubescent on both surfaces; petiole ¾–1 in. long, densely pubescent. Spikes 1–1½ in. long, many to a panicle, the lower branches of which spring from the axils of large leaves. Bracts obovate-cuneate, ¼ in. long, persistent, green at the base and drab at the top in the dried specimens. Calyx ⅛ in. long, infundibuliform, cut down nearly to the base into oblanceolate acute segments. Capsule ¼ in. long, split down nearly to the base into two rigid diverging valves, with a couple of seeds at the middle of each.—*Baron* 2442! Allied to *J. haplostachya* and *J. Commersoni*.

JUSTICIA (§ ANISOSTACHYA) TRITICEA, n. sp.

Fruticosa, glabra, ramulis gracillimis, foliis breviter petiolatis oblongis acutis, floribus in spicas densas pedunculatas paniculatas dispositis, bracteis rigidis oblongo-lanceolatis ciliatis dense imbricatis, calyce profunde bilabiato, corollæ tubo cylindrico, limbo brevi bilabiato, genitalibus ex tubo protrusis.

An erect shrub, with slender glabrous branchlets. Leaves 2–

3 in. long, narrowed from the middle to the base, moderately firm in texture, green and glabrous on both surfaces. Spikes very dense, secund, 1–1½ in. long, produced from the axils of the upper leaves on peduncles of about the same length. Bracts oblong-lanceolate, ⅙ in. long, with 5–7 prominent ribs on the back, the margin densely ciliated. Calyx about as long as the bract, glabrous; segments oblong-lanceolate. Corolla whitish, with a cylindrical tube as long as the calyx; limb $\frac{1}{12}$ in. long; upper lip obovate; lower deflexed, deeply 3-lobed. Capsule not seen.—*Baron* 2545! Allied to *J. Bojeri*, Nees.

ISOGLOSSA GRACILLIMA, n. sp.

Herbacea, glabra, ramulis gracillimis, foliis oblongis acutis membranaceis glabris, floribus in paniculas laxissimas terminales dispositis, pedicellis elongatis, calycis segmentis lanceolatis longe acuminatis, corollæ tubo infundibulari limbo brevi, antherarum loculis disjunctis, superiori interdum basi calcarato.

An erect perennial herb, glabrous in all its parts, with very slender branchlets. Leaves distant, opposite, shortly petioled, dark green, 1½–2 in. long. Flowers arranged in a very lax panicle, with very slender ascending few-flowered racemose branchlets; pedicels erecto-patent, ½–¾ in. long. Calyx ⅙ in. long, slit down nearly to the base into 5 lanceolate acuminate segments. Corolla yellow, ⅓ in. long; tube infundibuliform; limb bilabiate, half as long as the tube. Stamens 4, included in the corolla-tube, with long filaments and superposed small oblong anthers, the upper cell sometimes but not invariably spurred at the base.—*Baron* 2325!

ISOGLOSSA ANGUSTA, *Baker*.

Herbacea, ramulis gracillimis apice pubescentibus, floribus breviter petiolatis lanceolatis glabris, floribus in paniculas laxissimas terminales ramulis corymbosis dispositis, calycis segmentis lanceolatis, corollæ tubo infundibulari limbo brevi, antherarum loculis disjunctis oblongis.—Clinacanthus angustus, *Nees in DC. Prod.* xi. 511.

An erect perennial herb, with very slender branchlets, shortly pubescent towards the top. Leaves shortly petioled, 1½–2 in. long, ¼ in. broad. Panicle erect, very long and lax; pedicels ¼–½ in. long. Calyx ⅙ in. long, cut down nearly to the base into 5 lanceolate acute segments. Corolla yellow, ⅓ in. long; upper lip orbicular, shorter than the lower. Stamens included in the corolla-tube; cells of the anther much separated. Capsule with 2 diverging clavate valves ½ in. long, with 2 seeds at the middle of each.—*Baron* 2198! We have long had two sheets at Kew from the herbarium of Justice Blackburn.

ISOGLOSSA MELLERI, n. sp.

Herbacea, ramulis gracillimis apice pilosis, foliis breviter petiolatis ovatis acutis subglabris membranaceis, floribus in paniculas laxissimas terminales ramulis paucifloris corymbosis dispositis, pedicellis elongatis, calycis segmentis lanceolatis, corollæ tubo infundibulari limbo tubo æquilongo, antherarum loculis disjunctis oblongis.

An erect fragile perennial herb 2–3 feet high, with slender fragile branchlets pilose towards the tip. Leaves distant, opposite, turning black when dried, thin in texture, rounded at the base, the lower 1½–2 in. long. Flowers arranged in a very lax erect panicle, the lower branches of which spring from the axil of well-developed leaves; pedicels slender, erect, pilose, sometimes ½–¾ in. long. Calyx ⅙ in. long, pubescent at the base; tube very short. Corolla yellow, ½ in. long; lips very unequal, the lower with 3 large oblong divisions. Stamens included in the corolla-tube; anther-cells not spurred at the base. Capsule not seen.—Between Tamatave and Antananarivo, *Dr. Meller*! Three sheets in the Kew herbarium, the specimens gathered in 1862. Native name *Ravisara.*

HYPOESTES STACHYOIDES, n. sp.

Herbacea, perennis, glabra, foliis parvis breviter petiolatis remotis ovatis obtusis, floribus in spicas laxas paucifloras axillares et terminales dispositis, involucro unifloro bracteis 4 rigidulis oblongis acutis, calyce involucro paulo breviori, corollæ albæ tubo infundibulari, limbo tubo breviori, genitalibus ex tubo protrusis.

A herbaceous perennial, glabrous in all its parts, with slender ascending stems under a foot long. Leaves ½–¾ in. long, moderately firm in texture, green and glabrous on both surfaces. Spikes laxly few-flowered, erect, terminal, produced from the end of the stems and axils of the upper leaves. Involucre glabrous, ⅙ in. long; bracts much imbricated. Calyx but little shorter than the involucre. Corolla-tube ½ in. long; upper lip oblanceolate-oblong, entire, ¼ in. long; lower nearly as long, 3-lobed. Stamens reaching out of the tube halfway up the limb. Capsule not seen.—*Baron*, 2626! Allied to *H. maculosa*, Nees.

HYPOESTES UNILATERALIS, n. sp.

Herbacea, perennis, glabra, foliis petiolatis lanceolatis, floribus in paniculam terminalem ramulis brevibus secundis spicatis dispositis, involucro unifloro piloso bracteis 4 rigidulis oblongis, calyce involucro duplo breviori, corollæ albæ pilosæ tubo subcylindrico, labiis tubo duplo brevioribus, staminibus ex tubo breviter protrusis.

A herbaceous perennial, with short slender erect glabrous stems. Leaves 1–1½ in. long, ¼–⅓ in. broad, pinninerved, tapering gradually to the base, moderately firm in texture, green and glabrous on both surfaces; petiole ¼–⅓ in. long. Panicle with the lower branches produced from the axils of well-developed leaves. Involucre infundibuliform, ⅙ in. long; bracts dull green, densely pilose, much imbricated. Calyx 1/12 in. long; segments oblong-lanceolate. Corolla-tube ¼ in. long; limb half as long as the tube; upper lip oblong; lower deflexed, with 3 oblong lobes. Anthers just protruded from the corolla-tube. Capsule not seen.—*Baron* 2665! Allied to *H. secundiflora*, Baker.

HYPOESTES JASMINOIDES, n. sp.

Fruticosa, glabra, foliis brevissime petiolatis oblongis acutis pinninerviis, floribus in spicas laxas paucifloras paniculatas dispositis, involucro unifloro glabro bracteis 4 rigidulis acutis, calyce involucro paulo breviori, corollæ albæ tubo elongato subcylindrico labiis brevibus latis, genitalibus in tubo inclusis.

A much-branched shrub, with slender terete branchlets. Leaves 2–3 in. long, deltoid at the base, moderately firm in texture, green and glabrous on both surfaces; petiole not more than ⅛–⅙ in. long. Spikes 1–1½ in. long, produced only in the axils of the upper leaves, erect, shortly peduncled. Involucre glabrous, infundibuliform, ⅙ in. long; segments green, rigid, much imbricated. Corolla white, pubescent; tube ½ in. long, almost cylindrical; limb ¼ in. long; upper lip oblong, obtuse, entire; lower with 3 small obtuse lobes. Capsule not seen.—*Baron* 1224, 2533! Allied to *H. comorensis*, Baker in Journ. Linn. Soc. xx. p. 223.

HYPOESTES TRICHOCHLAMYS, n. sp.

Fruticosa, ramulis pubescentibus, foliis petiolatis oblongis acutis obscure pilosis, floribus in spicas secundas subdensas paniculatas terminales dispositis, involucro unifloro piloso segmentis 4 oblanceolatis obtusis, calyce quam involucrum paulo breviori, corollæ pilosæ albæ tubo quam involucrum sesquilongiori, limbo parvo segmentis oblongis.

A shrub, with slender pubescent tetragonous branchlets. Leaves distinctly petioled, moderately firm in texture, 2–3 in. long, cuneate at the base, dark green and thinly pilose on both surfaces. Spikes 1–2 in. long, ascending, arranged in small terminal panicles. Involucre narrowly infundibuliform, $\frac{1}{4}$–$\frac{1}{3}$ in. long; bracts firm in texture, densely pubescent, green towards the tip, drab towards the base. Calyx pale, more than half as long as the involucre; segments very acute. Corolla white, $\frac{1}{2}$ in. long, with a long tube and a short bilabiate limb with oblong segments. Stamens and stigma exserted from the corolla-tube.—*Baron* 2928! Allied to *H. saxicola*, Nees.

ORTHOSIPHON SECUNDIFLORUS, n. sp.

Fruticosus, ramulis pubescentibus, foliis oblongis acutis petiolatis pubescentibus serratis, floribus 2–3nis in racemos laxos secundos dispositis, pedicellis calyci fructifero æquilongis, calycis labio supremo brevi lato, labio inferiori dentibus lanceolato-deltoideis, corollæ tubo elongato cylindrico, limbo tubo duplo breviori, genitalibus in tubo inclusis.

Stems erect, shrubby, much branched, pubescent. Leaves 2–3 in. long, moderately firm in texture, distinctly serrated, green and pubescent on both sides. Racemes 1$\frac{1}{2}$–2 in. long; pedicels finally $\frac{1}{6}$ in. long; bracts minute, foliaceous, ovate. Calyx finally $\frac{1}{6}$ in. long; upper lip concave, scariose, strongly veined, not more than half as long as the campanulate tube; lower lip rather longer than the upper, the two lowest teeth the longest. Corolla-tube nearly $\frac{1}{4}$ in. long; lips half as long as the tube.—*Baron* 1226!

ORTHOSIPHON EMIRNENSIS, n. sp.

Herbaceus, ramulis pilosis, foliis petiolatis oblongis obtusis crenatis membranaceis, floribus laxe racemosis verticillatis, pedicellis calyci fructifero æquilongis, calycis labio supremo orbiculari concavo tubo æquilongo, labio inferiori dentibus lanceolatis, corollæ tubo cylindrico, limbo parvo, genitalibus in tubo inclusis.

A perennial herb, with finely pilose erect slender stems under a foot long. Leaves 1–2 in. long, membranous, deltoid at the base, green and glabrous on both surfaces; petiole $\frac{1}{4}$–$\frac{1}{2}$ in. long. Racemes peduncled, terminal, at most an inch long; flowers 3–6 in a whorl; pedicels finally $\frac{1}{6}$ in. long; bracts small, foliaceous, oblong-lanceolate. Calyx very accrescent, at first not more than $\frac{1}{12}$ in., finally $\frac{1}{4}$ in. long; upper lip suborbicular, as long as the campanulate tube, concave and conspicuously veined; lower lip with 3 rigid lanceolate teeth. Corolla with a cylindrical tube $\frac{1}{6}$ in. long; lobes of the limb minute, orbicular.—*Baron* 1056! 2190! 3259!

ORTHOSIPHON BREVICAULIS, n. sp.

Herbaceus, perennis, caule subnullo vel brevissimo, foliis magnis oblanceolato-oblongis obtusis serratis glabris, floribus verticillatis in racemum

laxum terminalem longe pedunculatum dispositis, pedicellis pubescentibus calyci fructifero æquilongis, calycis labio supremo concavo tubo æquilongo, labio inferiori dentibus parvis acutis, corollæ tubo elongato cylindrico labiis parvis, genitalibus ex tubo protrusis.

A perennial herb, with either all the leaves in a rosette from the crown of the root or one pair at the top of a short internode. Leaves 3–4 in. long, 1–1½ in. broad, firm in texture, green and nearly glabrous on both surfaces, narrowed gradually from the middle to the base, serrated in the upper half, entire in the lower. Raceme 1–2 in. long, shorter than its pubescent erect peduncle. Pedicels finally ¼ in. long. Calyx very accrescent, finally ¼ in. long; upper lip concave, quite as long as the tube; lower lip with 4 rigid deltoid or lanceolate-deltoid teeth. Corolla ⅓ in. long; lips not more than ¼ as long as the tube.—*Baron* 2656!

PLECTRANTHUS CYMOSUS, n. sp.

Perennis, pubescens, foliis longe petiolatis ovatis subacutis conspicue crenatis membranaceis, floribus in cymas verticillatas in paniculam elongatam terminalem cylindricam aggregatas dispositis, bracteis nullis, pedicellis ascendentibus pubescentibus, calyce parvo profunde bilabiato, corollæ tubo infundibulari prope basin curvato, fauce lata, labio postico parvo antico magno oblongo, staminibus ultra labium exsertis.

An erect perennial herb, 2–3 feet high, with a tetragonous stem, leafy up to the base of the inflorescence. Leaves opposite, 1½–2 in. long, nearly as broad, subacute, deeply crenate, dull green, thin in texture, slightly pubescent; petiole 1 in. long. Flowers in small cymes arranged in verticils of about four, forming a leafless cylindrical panicle nearly a foot long; pedicels short, ascending. Calyx campanulate, ⅛ in. long. Corolla lilac, pubescent, with a broadly funnel-shaped tube ¼ in. long, a small orbicular upper lip and an oblong acute concave lower lip as long as the tube. Stamens declinate, the two longer exserted beyond the lower lip of the corolla; anthers minute, orbicular.—*Baron* 2250!

LIPPIA OLIGOPHYLLA, *Baker in Journ. Linn. Soc.* XX. p. 225, proves to be identical with *Acrocephalus villosus*, Benth.

VITEX (§ CHRYSOMALLUM) TRICHANTHA, n. sp.

Erecta, fruticosa, ramulis apice pilosis, foliis simplicibus petiolatis oblongis acutis subcoriaceis facie glabris dorso pilosis, cymis axillaribus 1–2-floris, bracteolis lanceolatis pilosis, calycis tubo campanulato villoso dentibus lanceolatis tubo æquilongis, corollæ tubo piloso curvato infundibulari elongato, segmentis parvis, genitalibus breviter exsertis.

A much-branched erect shrub, with branchlets densely villose towards the tip. Leaves opposite, distinctly petioled, firm in texture, 2–3 in. long, rounded at the base, glabrous when mature above, pubescent mainly on the midrib beneath. Peduncles about ½ in. long. Calyx ⅓ in. long, very shaggy, with a pair of persistent bracteoles at the base. Corolla-tube curved, villose, above an inch long, ¼ in. in diam. at the throat; lobes of the limb very small, orbicular. Stamens and bifid style exserted beyond the tip of the corolla-segments; anthers minute, globose. Fruit not seen.—*Baron* 2316! Allied to *V. Bojeri*, Schauer,=*Baron* 2972!

CLERODENDRON? BRUNSVIGIOIDES, n. sp.

Fruticosa, erecta, glabra, foliis breviter petiolatis oblongis acutis, floribus axillaribus pedunculatis solitariis, calycis tubo infundibulari segmentis ovatis acutis tubo brevioribus, corollæ tubo infundibulari calyce duplo longiori, limbi segmentis orbicularibus, genitalibus in tubo inclusis.

An erect shrub, with slender branchlets, obscurely pilose towards the tip. Leaves 3–4 in. long, much narrowed to the base, simple, entire, moderately firm in texture, green and glabrous on both surfaces. Flowers solitary from the axils of the leaves on ascending peduncles 1–3 in. long. Calyx ½–⅝ in. long, clothed with adpressed hairs; teeth half as long as the tube. Corolla-tube above an inch long, dilated in the upper half; expanded limb an inch in diameter; orbicular subequal segments imbricated, about ½ in. long and broad. Stamens and style not protruded from the throat of the corolla-tube. Fruit not seen. —*Baron* 2716! Near *C.? petunioides*, Baker in Journ. Linn. Soc. xx. p. 230.

INCOMPLETÆ.

POLYGONIUM BRACHYPODUM, *Baker in Journ. Linn. Soc.* xx. p. 239—of which Mr. Baron now sends better specimens as No. 2208—proves identical with *P. Meissnerianum*, Cham. et Schlecht., which in America extends from Louisiana and Texas to South Brazil.

HYDROSTACHYS STOLONIFERA, n. sp.

***H.* caulibus longe reptantibus, foliis pedunculisque ad nodos cæspitosis, foliis longe petiolatis deltoideis decompositis segmentis ultimis minutis lanceolatis, floribus in spicas densas cylindricas pedunculatas dispositis, bracteis ovatis.**

Stems wide-trailing on the surface of the ground, rooting at the nodes, where they bear tufts of leaves and spikes. Petiole 1–2 in. long, rough with spreading papillæ; lamina reaching a length of 5–6 in.; pinnæ and pinnules deltoid; ultimate segments lanceolate, not more than $\frac{1}{16}$–$\frac{1}{24}$ in. long. Spikes several to a node, simple, peduncled, cylindrical, seen only in a young state. —*Baron* 2628! Allied to *H. multifida*, A. Juss.; Deless. Icones, vol. iii. t. 93.

Piper (§ Cubeba) pachyphyllum, n. sp.

Dioicum, fruticosum, glabrum, ramulis articulatis, foliis coriaceis oblongis acutis basi paulo inæqualibus late rotundatis vel subæqualibus, spicis fœmineis densifloris cylindricis oppositifoliis breviter pedunculatis, bracteis orbicularibus peltatis, fructibus ellipsoideis glabris distincte stipitatis, stigmatibus 3 sessilibus patentibus.

Stems shrubby, terete, articulated at the nodes. Leaves 4–5 in. long, 2–2½ in. broad, firm and thick in texture, green and glabrous on both surfaces, the secondary veins distant and very ascending, connected at the apex by intramarginal arches; petiole under ½ in. long. Female spikes only seen, finally 2½–3 in. long; peduncle ½–¾ in. long. Ovary with a pedicel as long as itself, black, glabrous; stigmas 3, sessile.—*Baron* 2415! Very near *P. borbonense*, C. DC., which Mr. Baron has gathered several times in Central Madagascar (1280! 1539! 2207! 2335!), and which Dr. Parker has sent under the native name *Ferifery*. Mr. Baron has also found *P. capense*, Linn. fil. (2518!), which extends to the Cape, the Zambesi country, Fernando Po, and the Cameroon Mountains.

Peperomia trichophylla, n. sp.

P. caule simplici semipedali flexuoso piloso, foliis alternis obovato-cuneatis obtusis petiolatis membranaceis utrinque pilosis venis lateralibus paucis valde ascendentibus, spicis elongatis gracillimis laxifloris ascendentibus pedunculatis, bracteis orbicularibus peltatis, ovario ovoideo sessili, stigmate sessili terminali.

Stems weak, flexuose, densely pilose. Leaf with a blade 1½–2 in. long, orbicular at the apex, cuneate in the lower half, membranous in texture, dark green and pubescent on both surfaces, the midrib and lateral veins distinctly visible when the leaf is held up to the light, as are the anastomosing connecting veinlets; petiole ½–¾ in. long. Spikes produced from the axils of the leaves on short slender peduncles, finally 3–4 in. long. Ovary ascending, glabrous, inserted in the grooves of the sulcate rhachis; stigma globose, sessile.—*Baron* 500! 3190! Allied to *P. Lyallii*, C. DC.

DILOBEIA THOUARSII, *Roem. & Sch.*

Of this very curious endemic Proteaceous tree Mr. Baron has now (No. 3253) procured complete specimens, from which the following notes are taken. Dr. Baillon has recently described it fully in the Bulletin of the Linnean Society of Paris, p. 394, from specimens gathered in the north-west of the island by M. Humblot.

A large tree with thick terete branchlets, coated with brown tomentum. Leaves alternate, rigidly coriaceous, glabrous; blade cuneate, deeply bifid, ½ ft. long and broad, the apical lobes semi-orbicular and simple in the mature leaf, prolonged and again forked in the young leaves; petiole 3–4 in. long, flattened and winged towards the top. Flowers diœcious, arranged in copious ascending axillary panicles about as long as the petiole, with a tomentose axis and branchlets; branchlets laxly spicate, each flower subtended by a minute ovate bract. Male perianth clavate, $\frac{1}{6}$ in. long, slit down to the base into four lanceolate valvate segments, glabrous inside. Stamens a little shorter than the perianth-segments; anther $\frac{1}{8}$ in. long, tipped with the protruded connective, much longer than the fleshy cylindrical filament. Female panicle shorter and less compound than the male. Ovary globose, densely ferruginous, with a short thick style and 2-lobed stigma. Fruit hard, thick, 1-seeded, indehiscent, oblong, 1¼ in. long. Native name *Vivaona.* The plant gathered by Dr. Parker, mentioned in Journ. Bot. 1882, p. 244, is a form of the same species.

VISCUM (§ PLOIONUXIA) LOPHIOCLADUM, n. sp.

Foliosum, glabrum, ramulis articulatis acute ancipitibus, foliis subsessilibus ovatis subobtusis rigide coriaceis venis occultis, floribus ad nodos sessilibus glomeratis bracteis in cupulam connatis, ovario globoso haud papilloso.

A shrub, with compressed woody branchlets with two raised angles, falling in pieces readily at the nodes, with internodes ¾–1 in. long. Leaves very thick and rigid in texture, 2–3 in. long, opaque, brown and quite glabrous on both surfaces when dried, rounded to a cuneate base. Flowers few in a cluster, quite sessile in the axil of the leaves, seen only in an early stage. Sepals deltoid.—*Baron* 2751!

VISCUM (§ PLOIONUXIA) RHYTIDOCARPUM, n. sp.

Foliosum, glabrum, ramulis teretibus granulosis, foliis subsessilibus oblongis obtusis crassis rigide coriaceis venis occultis immersis, floribus in umbellas subsessiles axillares 2–3-floras dispositis, bracteis in cupulam connatis, ovario globoso haud papilloso.

A much-branched shrub, with terete very granular branchlets, the internodes ½–1 in. long. Leaves very thick and rigid in texture, ¾–1 in. long, obtuse, narrowed at the base to an indistinct petiole, opaque and brown with a much-wrinkled epidermis on both surfaces when dried. Flowers 2–3 together in the axils of the leaves in a small oblong coriaceous cupule. Ovary not seen fully mature, but not at all papillose in an early stage.—*Baron* 3110! Near *V. triflorum*, DC.

VISCUM (§ PLOIONUXIA) GRANULOSUM, n. sp.

Foliosum, glabrum, ramulis teretibus granulosis, foliis oblongis subobtusis brevissime petiolatis basi attenuatis rigide coriaceis venis occultis, floribus 2–4nis in umbellas axillares brevissime pedunculatas dispositis, bracteis in cupulam connatis, ovario ovoideo granuloso, stylo brevissimo cylindrico, stigmate capitato.

A much-branched shrub, with slender terete very granular branchlets, breaking up easily at the nodes. Leaves 1½–2 in. long, obscurely petioled, very thick and rigid in texture, brown, rugose and opaque on both surfaces when dried. Umbels sometimes 3–4 to a node. Bracts ovate, spreading, coriaceous, slightly connate at the base. Mature ovary ⅙ in. in diam., shortly pedicellate, black, minutely papillose, tipped with a short cylindrical style, with a capitate stigma. Sepals 4, minute, oblong-lanceolate. —*Baron* 3115!

VISCUM (§ PLOIONUXIA) CUNEIFOLIUM, n. sp.

Foliosum, ramulis granulosis, foliis oppositis subsessilibus orbicularibus vel obovatis basi cuneatis crassis rigide coriaceis venis occultis, floribus 2–3nis in umbellas axillares brevissime pedunculatas dispositis, bracteis in cupulam connatis, ovario globoso lævi, stylo brevissimo cylindrico, stigmate capitato.

A much-branched shrub, with nearly terete slender scabrous branchlets, the upper internodes not more than ½ in. long.

Leaves opposite, very obtuse and very thick and rigid in texture, opaque, brown when dried, 1–1½ in. long, ¾–1 in. broad, narrowed very gradually at the base. Flowers in axillary umbels on very short peduncles; bracts coriaceous, connate into a small oblong cupule with a minutely ciliated margin. Sepals 4, minute, oblong, connivent. Mature ovary black, $\frac{1}{6}$ in. in diam., crowned with a very short style and capitate stigma.—*Baron* 2807!

VISCUM (§PLOIONUXIA) RADULA, n. sp.

Foliosum, glabrum, ramulis apice acute tetragonis, foliis subsessilibus oblongis parvis obtusis vel subacutis rigide coriaceis rugosis venis immersis occultis, floribus 1–3nis in umbellas axillares brevissime pedunculatas dispositis, bracteis in cupulam connatis ovario globoso scabro haud papilloso, stylo brevissimo cylindrico, stigmate capitato.

A much-branched shrub, glabrous in all its parts, with very slender terete acutely-angled branchlets, with internodes ½–¾ in. long. Leaves ½–¾ in. long, ¼–⅓ in. broad, thick and coriaceous in texture, acute or subobtuse, much narrowed at the base, opaque and nearly black when dried, very rough on both surfaces. Flowers 1–3 on a very short peduncle; bracts spreading, ovate, obtuse, minutely ciliated. Mature ovary black, $\frac{1}{12}$ in. in diam.; sepals lanceolate, very minute; style very short; stigma capitate. —*Baron* 3072! Allied to *V. triflorum*, DC.

VISCUM (§PLOIONUXIA) APODUM, n. sp.

Foliosum, glabrum, ramulis teretibus, foliis oblongis acutis subsessilibus basi attenuatis rigide coriaceis obscure trinervatis, floribus axillaribus solitariis bracteis minutis ovatis, ovario globoso densissime papilloso-muricato, stylo conico brevissimo, stigmate capitato.

A much-branched shrub, glabrous in all its parts, with slender subterete branchlets, with internodes ¾–1½ in. long. Leaves opposite, thick and rigid in texture, brownish and scabrous on both surfaces when dried, 2–3 in. long, ¾–1 in. broad at the middle, acuminate at both ends, the veins very obscure. Female flowers solitary and sessile in the axils of the leaves all down the branches; bracts minute, ovate, ciliated. Mature ovary globose, $\frac{1}{6}$ in. in diam., brown, densely coated with hard prominent papillæ; style very short.—*Baron* 3012! Allied to *V. tuberculatum*, A. Rich., and *V. multicostatum*, Baker.

VISCUM (§ASPIDUXIA) TRACHYCARPUM, n. sp.

Aphyllum, ramulis teretibus glabris ad nodos articulatis, floribus 1–3nis

ad nodos sessilibus, ovario globoso nigro dense papilloso-muricato, stylo brevissimo, stigmate capitato.

A much-branched shrub, with terete many-ribbed divaricating branchlets, breaking up readily at the nodes, with internodes 1–1½ in. long. Flowers 2–6 in sessile verticels at the nodes. Mature ovary black, globose, $\frac{1}{12}$ in. in diam., covered all over with prominent hard black papillæ; style very short, cylindrical; stigma capitate. Male flowers and sepals not seen.—*Baron* 2408!

EUPHORBIA TETRAPTERA, n. sp.

Arborea, glabra, foliis alternis petiolatis oblongis integris acuminatis subcoriaceis, capitulis in paniculam decompositam terminalem ramis dichotomiter cymosis dispositis, bracteis parvis lanceolatis persistentibus, involucro campanulato appendicibus 5 orbicularibus integris carnosis, dentibus minutis quadratis emarginatis, ovario biloculari, styli ramis brevibus apice emarginatis, carpellis fructiferis globosis dorso bialatis.

A much-branched erect tree, with woody terete not at all fleshy branchlets. Leaves 2–3 in. long, acuminate, entire, deltoid at the base, moderately firm in texture, mostly alternate but the upper opposite, green and glabrous on both surfaces, with fine distinct main veins anastomosing in intramarginal arches. Panicles 2–3 in. in diam., at the end of the branchlets, overtopped by the upper whorled leaves. Involucre with a campanulate tube $\frac{1}{16}$ in. in diam. and 5 orbicular entire spreading segments, with a minute square erect tooth between each. Fruit ½ in. in diam., conically narrowed at the base into an erect gynophore ⅛ in. long; carpels never more than two, globose, coriaceous, with two deltoid wings from the upper part; styles unusually short and notched at the apex only.—*Baron* 2775! 3037! A very curious and distinct species.

UAPACA MYRICÆFOLIA, n. sp.

Arborea, glabra, foliis parvis brevissime petiolatis oblanceolato-oblongis obtusis rigide coriaceis, floribus masculis in capitulos globosos bracteis 4 coriaceis glabris persistentibus reflexis cinctos dispositis, fructu globoso glabro 4-loculari.

A much-branched erect tree, glabrous in all its parts. Leaves ascending, 1½–2 in. long, ½–¾ in. broad above the middle, very obtuse, narrowed gradually from the middle to the base, firm and rigid in texture, green and glabrous on both surfaces, with fine indistinct erecto-patent main veins. Male heads globose, ¼ in. in

diam., girt with 4 persistent cuneate reflexing coriaceous glabrous bracts; peduncle about an inch long. Fruit hard, glabrous, globose, $\frac{1}{3}$ in. in diam., with a thin coriaceous epicarp and 4 pyrenes. —*Baron* 2209! 2864! 2961!

UAPACA CLUSIOIDES, n. sp.

Glabra, ramulis percrassis, foliis magnis obovato-cuneatis petiolatis rigide coriaceis obtusis, floribus fœmineis ignotis, floribus masculis in capitulos globosos axillares pedunculatos dispositis, bracteis reflexis coriaceis, perianthio obconico coriaceo ore piloso, staminibus 5 exsertis.

A tree, glabrous in all its parts except the perianth, with the leaves and male heads produced from terete woody branches half an inch in diameter. Leaves 6–8 in. long, 4–5 in. broad above the middle, very thick and rigid in texture, green and glabrous on both surfaces, with 6–8 pairs of parallel arcuate-ascending main veins distinct from the midrib to the margin; petiole 1–1$\frac{1}{2}$ in. long. Male heads globose, $\frac{1}{2}$ in. in diam., enclosed in a whorl of very much imbricating persistent reflexing orbicular-cuneate bracts; peduncle rugose, erecto-patent, 1–1$\frac{1}{4}$ in. long. Male perianth $\frac{1}{12}$ in. long, formed of 5 coriaceous segments. Stamens 5, much longer than the perianth; anthers oblong. Fruit unknown.—*Baron* 2546!

BRIDELIA COCCOLOBÆFOLIA, n. sp.

Arborea, glabra, foliis petiolatis ovatis vel oblongis cordatis subcoriaceis lucidis, floribus fœmineis in paniculam terminalem ramulis spicatis dispositis glomeratis, perianthii segmentis ovatis, disco cupulari, fructu ellipsoideo coriaceo venoso apiculato, semine solitario.

A tree, glabrous in all its parts, with terete woody branchlets. Leaves alternate, 3–4 in. long, 1$\frac{1}{2}$–2 in. broad, obtuse or subobtuse, shortly cordate at the base, firm in texture, green and rather glossy above, opaque beneath, with 10–12 pairs of very distinct arcuate-ascending veinlets. Female flowers arranged in several dense spikes 2–3 in. long, which form a terminal panicle, sessile and clustering on the branchlets. Fruit 6 in. in diam., dark brown, coriaceous in texture, with a distinctly veined epicarp, girt at the base by the persistent campanulate perianth, with its ovate segments, and inserted on a much-raised disk. Male flowers not seen.—*Baron* 2330! 2450! Allied to *B. angolensis*, Müll. Arg.

ACALYPHA HOLOGYNA, n. sp.

Fruticosa, monoica, ramulis junioribus obscure pilosis, foliis oblongis acutis membranaceis serratis subglabris petiolatis, floribus masculis in spicas graciles cylindricas dispositis glomeratis bracteis ovatis scariosis persistentibus, floribus fœmineis 1–2nis ad foliorum superiorum axillas pedunculatis, bracteis unifloris orbicularibus hispidis serratis, stigmatibus capillaceo-multifidis.

A shrub with slender woody glabrous old branchlets, those of the year zigzag and obscurely pubescent. Leaves alternate, 3–4 in. long, about an inch broad, acute, distinctly serrated, thin in texture, green on both surfaces and very nearly glabrous; petiole about $\frac{1}{2}$ in. long. Male flowers in copious cylindrical spikes 2–3 in. long from the older leafless branchlets; flowers several in a cluster; bud green, globose, glabrous, $\frac{1}{24}$ in. in diam.; segments ovate; bracts brown, scariose, persistent, $\frac{1}{12}$ in. long. Female flowers one to a cluster, enclosed in a foliaceous toothed bract which is orbicular when folded up and $\frac{1}{8}$ in. in diam., the clusters usually solitary, rarely geminate, on a short peduncle from the axil of a leaf on the young branchlets. Stigmas $\frac{1}{8}$–$\frac{1}{6}$ in. long, cut into very numerous capillary segments.—*Baron* 2889!

MACARANGA MYRIOLEPIDA, n. sp.

Arborea, ramulis gracilibus apice lepidotis obscure pilosis, foliis parvis confertis brevissime petiolatis obovatis obtusis subcoriaceis facie viridibus glabris dorso densissime albido-lepidotis, floribus masculis ignotis, floribus fœmineis in spicas axillares breviter pedunculatas dispositis, perianthii segmentis parvis oblongis, fructu globoso magnitudine pisi parvi lepidoto uniloculari, stylo brevissimo.

A much-branched erect shrub or tree, with terete branchlets glabrous except at the very tip. Leaves about an inch long, very obtuse, rounded at the base, moderately firm in texture, green and glabrous above, covered beneath with minute greenish-white lepidote scales, the 5–6-jugate arcuate-ascending main veins distinct from midrib to margin. Female spikes of 4–8 crowded flowers on short peduncles from the leaf-bearing branchlets. Perianth-segments minute, persistent. Fruit $\frac{1}{6}$ in. in diam., densely lepidote, finally splitting open to the base, filled up with the single brown seed.—*Baron* 3133!

MACARANGA RIBESIOIDES, n. sp.

Arborea, glabra, ramulis validis, foliis longe petiolatis obovatis cuspidatis rigide coriaceis utrinque viridibus, floribus masculis ignotis, floribus fœmineis in racemos copiosos axillares pedunculatos dispositis, perianthii segmentis parvis ovatis, fructu globoso magnitudine pisi parvi uniloculari, stigmate elongato.

A much-branched tree, glabrous in all its parts. Leaves 2–3 in. long, ¾–1¼ in. broad above the middle, more or less cuspidate, narrowed below the middle to a rather rounded base, moderately firm in texture, green and glabrous on both surfaces, with 6–8 pairs of arcuate-ascending main veins distinct from midrib to margin. Female flowers in racemes of 6–8 on short peduncles from the flowering branchlets; bracts minute, deltoid; pedicels finally 1/22 in. long. Fruit globose, ⅙ in. in diam., lepidote, girt at the base by the persistent perianth; style 1/12 in. long, subulate. —*Baron* 2898!

Chætacme madagascariensis, n. sp.

Arborea, glabra, aculeata, foliis breviter petiolatis late oblongis rigide coriaceis lucidis, floribus fœmineis solitariis axillaribus brevissime pedicellatis, fructu globoso stigmatibus 2 subulatis coronato.

A tree, glabrous in all its parts, with the slender terete branches armed with an erecto-patent pungent spine ⅓–½ in. long from the axil of each leaf. Leaves alternate, very thick and rigid in texture, 2–2½ in. long, 1–1½ in. broad at the middle, glossy on both surfaces, subobtuse, unequal at the base, with a strong midrib and fine side-veins; petiole ¼ in. long. Male flowers not seen. Drupes globose, ⅓ in. in diam., solitary on short pedicels in the axils of the leaves, with a large endocarp. Stigmas subulate, persistent, ¼ in. long.—*Baron* 2397! This is a genus allied to *Celtis*, of which only a single species is already known, which extends from the Cape to Angola and Niam-Niam Land.

Ficus (§Urostigma) tiliæfolia, n. sp.

Glabra, stipulis parvis coriaceis, foliis alternis petiolatis cordato-orbicularibus subcoriaceis scabris, receptaculis magnis solitariis sessilibus globosis.

A shrub, with sulcate moderately stout brown glabrous branchlets. Leaves 4–5 in. long and broad, deltoid at the apex, entire, decidedly cordate at the base, green and glabrous on both surfaces, scabrous above, with 5–6 pairs of erecto-patent main veins reaching the margin; petiole 1–1½ in. long; bracts small, rigid in texture. Receptacles 1 in. in diam., very coriaceous, glabrous, sessile from the side of small leafy branchlets.—*Baron* 3285!

Ficus (§Urostigma) sphærophylla, n. sp.

F. ramulis glabris, stipulis membranaceis acuminatis, foliis alternis petiolatis magnis cordato-orbicularibus integris cuspidatis tenuibus glabris,

receptaculis globosis glabris magnitudine mediocribus axillaribus breviter pedunculatis, bracteis 3 patulis deltoideis.

A shrub, glabrous in all its parts, with moderately stout terete branchlets. Leaves 6–8 in. long and broad, deeply cordate, acutely cuspidate at the apex, thin in texture, green and glabrous on both surfaces, with about 5 pairs of parallel erecto-patent main veins; petiole about 1 in. long; stipules acuminate, brown, scariose, about the same length. Receptacles ½ in. in diam., on peduncles of about the same length, from the leaf-bearing branchlets; bracts 3, small, spreading. Perianth-segments lanceolate. Style cylindrical.—*Baron* 2381!

FICUS (§UROSTIGMA) PODOPHYLLA, n. sp.

Glabra, stipulis parvis, foliis alternis longe petiolatis cordato-ovatis integris acutis subcoriaceis, receptaculis globosis glabris magnitudine mediocribus longe pedicellatis ad ramos haud foliatos productis, bracteis 3 deltoideis suffultis.

A shrub, glabrous in all its parts, with slender terete woody branchlets. Leaves like those of the balsam-poplar in shape and size, 3–4 in. long, very acute, quite entire, slightly cordate at the base, moderately firm in texture, green and glabrous on both surfaces, with distant erecto-patent main veins; petiole slender, 2–3 in. long. Receptacles globose, ½ in. in diam., geminate on pedicels about an inch long from thickened leafless branchlets; bracts 3, deltoid, persistent, squarrose. Style twice as long as the young ovary. Perianth-segments lanceolate, as long as the ovary and style.—*Baron* 3323!

FICUS (§UROSTIGMA) MEGAPODA, n. sp.

Glabra, stipulis magnis coriaceis acuminatis, foliis alternis longissime petiolatis cordato-ovatis acutis integris subcoriaceis, receptaculis axillaribus solitariis pedunculatis globosis glabris magnitudine mediocribus, bracteis parvis deltoideis.

A shrub, glabrous in all its parts, with moderately stout woody branchlets. Leaves like those of the balsam-poplar, 3–4 in. long, cuspidate at the apex, quite entire, broadly rounded or cordate at the base, moderately firm in texture, green and glabrous on both surfaces, with distant erecto-patent main veins; petiole 2–3½ in. long; stipules 1½ in. long, glabrous, acuminate. Receptacles ¾ in. in diam., glabrous, with a thick very coriaceous skin, on a peduncle of about the same length from the axil of a leaf; bracts 3, small, persistent. Perianth-segments lanceolate, twice as long the chestnut-brown fruit, which is tipped with a cylindrical style.—*Baron* 2536! 3305!

FICUS (§UROSTIGMA?) TRICHOPHLEBIA, n. sp.

F. ramulis glabris, stipulis parvis pilosis coriaceis, foliis alternis longe petiolatis cordato-orbicularibus cuspidatis integris subcoriaceis facie scabris dorso pubescentibus, receptaculis globosis pilosis parvis ad ramos efoliatos paniculatis, bracteis minutis deltoideis.

A shrub, with moderately stout sulcate woody glabrous branchlets. Leaves 5–7 in. long and broad, deeply cordate at the base, deltoid with a small cusp at the apex, green on both sides, very scabrous above, clothed all over with short fine brown pubescence beneath, with about 5 pairs of strong erecto-patent main veins; petiole $2\frac{1}{2}$–3 in. long; bracts under an inch long. Receptacles globose, pilose, $\frac{1}{2}$ in. in diam., mammillate at the apex, arranged in a copious terminal panicle on leafless branchlets; bracts 3, minute, deltoid; pedicels $\frac{1}{4}$–$\frac{1}{3}$ in. long. Ovary with a long unilateral style. Perianth-segments lanceolate, as long as the ovary and style. Fruit subglobose, dark brown.—*Baron* 2417!

FICUS (§UROSTIGMA) APODOCEPHALA, n. sp.

F. ramulis validis glabris, stipulis magnis lanceolatis membranaceis, foliis alternis petiolatis oblongis pedalibus rigide coriaceis utrinque glabris, venis primariis 8–10-jugis ascendentibus intra marginem anastomosantibus, receptaculis sessilibus axillaribus parvis globosis pilosis, bracteis 3 magnis deltoideis coriaceis suffultis.

A shrub, with strongly-angled glabrous branchlets $\frac{1}{2}$ in. in diam. Stipules brown, membranous, $1\frac{1}{2}$ in. long. Petiole varying in length from 1 to 3 inches; blade nearly a foot long, 4–$4\frac{1}{2}$ in. broad, obtuse, rounded at the base, rigid in texture, green and glabrous on both surfaces, with 8–10 pairs of strong ascending main veins anastomosing in arches within the margin. Receptacles globose, sessile, geminate in the axils of the leaves, $\frac{1}{2}$ in. in diam., subtended at the base by three large coriaceous persistent deltoid bracts. Perianth-segments lanceolate. Ovary with a long style.—*Baron* 2521!

UREBA SPHÆROPHYLLA, n. sp.

Sarmentosa, ramulis gracilibus glabris apice parce setosis, foliis petiolatis orbicularibus cuspidatis modice firmis glabris ad costam faciei inferioris parce hispidis, floribus fœmineis in paniculas axillares ramulis divaricatis spicatis dispositis, ovario glabro ovoideo obliquo, stigmate magno capitato.

A subscandent shrub, with slender terete woody glabrous branchlets, bristly only at the young tips. Leaves moderately firm in texture, 1½–2 in. long and broad, bluntly cuspidate, entire, broadly rounded at the base, glabrous except a few minute bristles on the midrib beneath. Male flowers not seen. Female flowers in sessile axillary deltoid panicles about an inch long, with a few spreading slender slightly bristly spicate branches. Fruit glabrous, oblique ovoid, $\frac{1}{12}$ in. long, crowned with a large orbicular sessile stigma.—*Baron* 3179! Nearly allied to the Mauritian *U. acuminata*, Gaudich.

PILEA CAPITATA, n. sp.

Herbacea, perennis, inermis, dioica, foliis oppositis breviter petiolatis valde inæqualibus oblongis acutis serratis, floribus in capitulos axillares longe pedunculatos dispositis, perianthio masculo tubo campanulato segmentis 4 parvis deltoideis, perianthii fœminei segmentis valde inæqualibus, fructu ovoideo compresso acute marginato.

An erect herbaceous perennial, with simple glabrous unarmed stems under a foot long. Leaves in opposite pairs, shortly petioled, very unequal in size, moderately firm in texture, distinctly serrated, triplinerved from base to apex, green and slightly hispid on both surfaces, the larger ones 1½–2 in., the smaller ⅓–½ in. long. Flowers of both sexes in dense capitate cymes on long axillary ascending peduncles. Male perianth $\frac{1}{16}$ in. long, gamophyllous, with 4 small deltoid segments. Fruit $\frac{1}{12}$ in. long, brown, flat, glabrous, not at all oblique, tipped with a minute capitate stigma.—*Baron* 2528! 2621! Belongs to the small section Heterophyllæ, of which only two Old-World species are already known.

PILEA LONGIPES, n. sp.

Herbacea, perennis, inermis, dioica, foliis longe petiolatis ovatis æqualibus serratis triplinerviis, floribus in paniculos cymosos longe pedunculatos axillares dispositis, perianthio masculo tubo gamophyllo campanulato, segmentis 4 parvis deltoideis.

An erect unarmed herbaceous perennial with much-branched stems under a foot long. Leaves moderately firm in texture, 1–1½ in. long, triplinerved from base to apex, subobtuse, distinctly serrated, rounded at the base, obscurely hispid on both sides; petiole ½–¾ in. long. Male cymes corymbose at the tip of a long peduncle ascending from the axils of the upper leaves. Male perianth $\frac{1}{16}$ in. long, with a campanulate tube and 4 small segments; pedicel about as long as the perianth, articulated at the tip. Female flowers and fruit not seen.—*Baron* 3261! Allied to *P. umbellata*, Weddell, of Bourbon.

PODOCARPUS (§EUPODOCARPUS) MADAGASCARIENSIS, n. sp.

Arborea, glaberrima, ramulis apice tetragonis, foliis sessilibus lanceolatis rigide coriaceis uninerviis, floribus fœmineis solitariis axillaribus sessilibus, receptaculi bracteis oblongis, fructu globoso magnitudine pisi.

A much-branched tree, with verticillate final branchlets. Leaves alternate, very rigid in texture, reaching a length of 5–6 in. and a breadth of $\frac{1}{2}$ in., acuminate, narrowed to the base, drab and rather glossy on both surfaces, flat, furnished with a distinct midrib, all the other veins hidden, the margin very narrowly recurved. Male flowers not seen. Female flowers solitary in the axils of the leaves. Receptacle $\frac{1}{12}$ in. long, the oblong bracts free at the obtuse tip. Fruit hard, globose, brownish-black, smooth, glaucous, $\frac{1}{3}$ in. in diam.—*Baron* 2794! 3129! *Parker*! "Wild and abundant in the forests of the interior. Wood extensively used in house-building, for flooring &c. Native name 'Hetatra.'" Nearly allied to the Cape *P. Thunbergii*, Hook., in London Journ. Bot. i. 657, t. 221.

MONOCOTYLEDONS.

PANDANUS (§SUSSEA) MICROCEPHALUS, n. sp.

P. foliis ensiformibus sesquipedalibus rigidulis aculeis crebris ascendentibus marginatis, capitulis fructiferis subsessilibus solitariis parvis globosis, drupis 50–60 oblanceolato-hexagonis 1- raro 2-locellatis dimidio superiori liberis, apice libero oblongo-hexagono, stigmate magno reniformi adpresso.

Leaves densely crowded at the summit of the peduncle, $1\frac{1}{2}$ ft. long, an inch broad at the base, tapering to the point, not very rigid in texture, margined with close minute erecto-patent prickles. Fruit-head globose, solitary, nearly sessile, $\frac{3}{4}$–1 in. in diam. Drupes 50–60, usually 1-celled, free in the upper half, $\frac{1}{4}$ in. long, $\frac{1}{8}$ in. in diam.; free apex oblong, angled; solitary stigma horny, reniform, flat, $\frac{1}{12}$ in. in diam., occupying the whole tip.—*Baron* 2321! Native name, "Isirihoalavo." Allied to *Sussea conoidea*, Gaudich., Atlas Bonite, tab. 24; but that species has an oblong head 4–5 in. long and only the upper third or quarter of the drupes free.

PANDANUS (§SUSSEA) OLIGOCEPHALUS, n. sp.

P. foliis ensiformibus sesquipedalibus aculeis crebris minutis erecto-patentibus marginatis, capitulis 2–3 parvis globosis, drupis 20–30 1-locellatis oblongo-hexagonis dimidio superiori liberis, apice libero conico, stigmate sessili parvo reniformi.

Leaves crowded at the top of the peduncle, ensiform, not very rigid in texture, 1½ ft. long, an inch broad at the base, margined by minute close erecto-patent prickles. Fruit-heads 2–3 on a short peduncle, 1–1½ in. in diam. Drupes 20–30 to a head, all 1-celled, oblong-hexagonal, ½ in. long, ¼–⅓ in. in diam., free in the upper half; free apex conic, angled; stigma flat, sessile, reniform, $\frac{1}{16}$ in. in diam., occupying the whole of the tip.—Forest 40 miles from the coast, *Baron* 1666!

PANDANUS (§VINSONIA) CONCRETUS, n. sp.

P. foliis 5–6-pedalibus ensiformibus rigide coriaceis, capitulis fructiferis solitariis magnis oblongis, drupis 40–50 hexagono-cuneatis apice rotundato solum liberis, stigmatibus 6–12 parvis planis reniformibus in areolam paulo elevatam circulariter dispositis segregatis.

Fully-developed leaf 5 or 6 ft. long, very rigid in texture, 5 in. broad at the base, tapering gradually to the apex; prickles lanceolate-deltoid, erecto-patent, sometimes ½ in. apart. Fruit-heads solitary, oblong, 3–4 in. in diam. Drupes ¾–1 in. broad each way at the top, ½ in. in diam. at the base, connate except the top ¼–⅓ inch; apex rounded, with a rather polished brown smooth epicarp, in the centre of which the 6–12 small flat reniform stigmas are disposed in an irregular circle on a slightly raised areole occupying the central half of the free apex; epicarp of the concrete portion splitting up into copious fine fibres; endocarp thick and woody. Peduncle 1 in. in diam. just beneath the head.—*Baron* 2778! Differs from *P. utilis* (Gaudich., Atl. Bonite, tab. 17. figs. 1–5) by the drupes being free at the very top only, and the stigmas not crowded but forming an irregular ring ¼–⅓ in. broad.

PANDANUS (§VINSONIA) CERATOPHORUS, n. sp.

P. foliis ensiformibus rigide coriaceis 3–4-pedalibus aculeis marginalibus parvis crebris ascendentibus, capitulis fructiferis solitariis oblongis, drupis 50–60 hexagono-cuneatis 5–6-locellatis quarto superiore liberis, apice libero conico, stigmatibus confertis stylo producto uncinato deciduo.

Fully-developed leaves ensiform, rigidly coriaceous, 3–4 ft. long, 3 in. broad at the base, tapering gradually from base to apex, margined with close small ascending prickles. Peduncle ½ ft. long, its leaves at the top linear, not more than a foot long and ½ in. broad. Fruit-heads solitary, oblong, erect, 3 in. long, 2 in. in diam. Drupes 50–60 to a head, hexagonal, ½ in. in diam. at the top, ¼ in. at the base, scarcely compressed laterally; free apex conical, the 5–6 stigmas crowded in a small flattened space in its centre; epicarp breaking up into fine parallel fibres; endocarp brown and horny. Styles columnar, ⅙ in. long, horny, tapering to the apex, deciduous.—*Baron* 2320! Heads like those of *Vinsonia humilis* and *Pervilleana*, as figured by Gaudichaud, Atl. Bonite, t. 17 and 31. Styles like those of *P. sechellarum*, Balf. fil.

DRACÆNA XIPHOPHYLLA, n. sp.

Arborea, foliis sessilibus ensiformibus subcoriaceis viridibus 3–4-pedalibus costa obscura, floribus in paniculam amplam deltoideam dispositis, ramis patulis dense racemosis bracteis primariis magnis lanceolatis, pedicellis dense glomeratis apice articulatis bracteis propriis minutis deltoideis, perianthii segmentis tubo cylindrico subæquilongis, staminibus segmentis æquilongis.

Leaves 3–4 ft. long, 1¼ in. broad at the middle, tapering gradually to an acute point, narrowed to ⅜–¾ in. above the dilated clasping base, firm in texture, closely veined, the midrib visible only when looked at from beneath and lost some distance from the apex. Branches of the panicle shortly peduncled, the lower a foot long; lower bracts 3–4 in. long; rhachis stout and deeply grooved; pedicels usually 6–8 in a cluster, ⅙ in. long, articulated at the apex. Perianth ⅝–¾ in. long.; segments ligulate, equalling the cylindrical tube. Anthers small, oblong, placed opposite the tip of the perianth-segments. Berry usually with one seed, the size of a pea.—*Baron* 2455! 2729! 2804! A fine plant, midway between *D. fragrans* and *D. floribunda*.

DIOSCOREA ACUMINATA, n. sp.

Volubilis, glabra, caulibus gracillimis bulbilliferis, foliis petiolatis cordato-ovatis integris acuminatis viridibus, floribus fœmineis solitariis in spicas laxas axillares dispositis, bracteis minutis deltoideis, pedicellis flori æquilongis, ovario obconico, perianthii segmentis viridibus orbicularibus, perianthio masculo fructuque ignotis.

A herbaceous climber, glabrous in all its parts, with very slender stems, bearing globose bulbillæ the size of a pea in the axils of some of the leaves. Leaves 2–3 in. long, moderately firm in texture, green on both surfaces, deeply cordate, with 7 main ribs radiating from the apex of the petiole. Female racemes solitary in the axils of the leaves, few-flowered, simple, 1–1½ in. long, shortly peduncled; pedicels solitary, $\frac{1}{12}$ in. long; bracts minute, deltoid. Expanded perianth greenish, ⅛ in. in diam.; segments orbicular, equalling the obconic ovary.—*Baron* 2654!

ERIOCAULON FLUITANS, *Baker in Journ. Linn. Soc.* xx. p. 277 (*Baron* 926), proves conspecific with *E. melanocephalum*, Kunth (*E. aquaticum*, Sagot.), of Guiana and North Brazil. (*Sagot* 1330! *Burchell* 4208!)

CYPERUS ALTERNIFOLIUS, *Linn.* Of this, which is common in gardens, Mr. Baron has now sent wild specimens (2707!), the first we have received.

CYPERUS (§PAPYRUS) IMERINENSIS, *Boeckl. in Engler Jahrb.* 1884, p. 500. Founded on Hildebrandt's 3798. Very nearly allied to the Egyptian Papyrus.—*Baron* 3274!

CYPERUS DIVULSUS, *Ridley in Journ. Bot.* 1884, p. 15. Hildebrandt's collecting number should be 4020, not 4080 as printed. Dr. Boeckler has described the same plant under the name of *C. paucispiculatus*, in Engler's Jahrbuch for 1884, p. 497.

DICHRONEMA CANDIDA, *Baker.*—Psilocarya candida, *Nees in Mart. Fl. Bras.* ii. p. 117.—Rhynchospora candida, *Boeckl. in Linnæa*, xxxvii. p. 605.—Cyperus leucostachys, *Bojer MSS.*—*Baron* 2340! Bombatoka, *Bojer*! Known elsewhere in West Tropical Africa and Guiana.

HELEOCHARIS (§HELEOGENES) CÆSPITOSISSIMA, n. sp.

Densissime cæspitosa, stolonifera, foliis propriis nullis, caulibus gracillimis 1½–2 pollicaribus, floribus 5–6 in spicam oblongam terminalem dispositis, glumis ovato-lanceolatis castaneis obtusis valde imbricatis margine pallidis dorso viridi carinatis, nuce oblonga, stylo trifido, setis hypogynis 6 nuci æquilongis.

Stems forming very dense masses and sending out a few rooting stolons, very slender, tetragonous, greenish, 1½–2 in. long. Spike oblong, terminal, $\frac{1}{12}$–⅛ in. long. Glumes about 6 to a spike, erecto-patent, much imbricated, obtuse, navicular, bright chestnut-brown, with a distinct pale keel, and becoming gradually whitish towards the edge. Nut oblong, greenish, half as long as the glume, enclosed in the whorl of pale ciliated hypogynous bristles, which are united into a distinct whitish cup at the base.—*Baron* 2242! Nearly allied to *H. chætaria*, Rœm. and Sch., and *H. minuta*, Boeckl. in Engler's Jahrb. 1884, p. 503.

CLADIUM (§MACHÆRINA) PANTOPODUM, n. sp.

Perenne, 2–3-pedale, foliis distichis linearibus rigide coriaceis, spiculis clavatis omnibus pedicellatis in paniculam angustam elongatam dispositis, glumis 6–7 castaneis inferioribus parvis ovatis, superioribus oblongis, floribus 1–2, staminibus 3 linearibus, stylo profunde trifido, setis hypogynis 6 subulatis ciliatis.

Tufts densely cæspitose. Basal leaves rigid in texture, 1–1½ ft. long, ⅙ in. broad, tapering to a point, nearly flat on the face, rather convex on the back, with a suddenly dilated oblong brown base with a crisped edge. Stems 1½–2 feet below the inflorescence, with a few reduced leaves. Panicle a foot long, with distinct ascending corymbose branches. Spikelets ⅙ in. long, with 3–4 small ovate empty glumes at the base and 3 longer oblong ones. Styles ⅙ in. long, protruded from the apex of the spikelet. Hypogynous bristles very slender, about as long as the flowering glumes.—*Baron* 2072! 3316! Allied to the West-Indian *Machærina restioides*, Vahl, and *M. filifolia*, Griseb., and perhaps also to *C. xipholepis* of the Seychelles, which is known only in an immature condition.

CLADIUM (§MACHÆRINA) MELLERI, n. sp.

Perenne, orgyale, foliis distichis linearibus rigide coriaceis, spiculis cylindricis omnibus pedicellatis in paniculam angustam elongatam dispositis, glumis circiter 15 castaneis inferioribus multis parvis ovatis, superioribus paucis magnis oblongo-lanceolatis, floribus 1–2, staminibus 3 linearibus, stylo profunde trifido, setis hypogynis 6 subulatis ciliatis.

A near ally of the last, of which it may be possibly only a variety. It quite agrees with it in the structure of the flowers, but differs by its much more robust habit and taller growth, and much more numerous spikelets sheathed by 10–12 small closely imbricated barren glumes at the base instead of only 3 or 4 and more acute produced inner glumes. The whole plant reaches the height of a man, the panicle and leaves being each about 3 feet in length, the latter ½ in. broad at the top of the large dilated base and tapering gradually to an acuminate apex.—*Baron* 1026! 2846! Between Tamatave and Antananarivo, *Dr. Meller*!

CAREX BARONI, n. sp.

Dense cæspitosa, foliis linearibus elongatis, caule gracili acute triquetro,

spicis fœmineis 5–6 cylindricis pedunculatis cernuis superne densis inferne laxis, glumis oblongis brunneis dorso nervis 3 viridibus percursis, perigynio ellipsoideo lenticulari viridi obscure rostrato faciebus multinervatis, stylo bifido, spica mascula unica terminali.

A densely cæspitose swamp species. Leaves linear, 2–3 ft. long, $\frac{1}{4}$ in. broad at the base, erect, firm in texture, closely ribbed, glabrous, tapering to the point, prominently costate. Stem $1\frac{1}{2}$–2 ft. long below the inflorescence, slender, sharply 3-angled. Female spikes 5–6, cylindrical, cernuous, 4–5 in. long, $\frac{1}{8}$–$\frac{1}{6}$ in. in diam., the lower distinctly peduncled and subtended by long leaves, the upper with a few male flowers at the top. Glumes obtuse, $\frac{1}{8}$ in. long, brown and membranous towards the edge, firm in texture in the centre, with 3 strong ribs. Perigyne as long as the glume, greenish, distinctly margined, narrowed into a short entire beak, each face with several distinct vertical ribs. Male spike erect, terminal, 4–5 in. long, its glumes like those of the female.—*Baron* 2795! Nearest *C. stricta* of our British species, and a near ally of *C. madagascariensis*, Boeckl. in Engler's Jahrb. 1884, p. 517, founded on Hildebrandt's 3753.

OPLISMENUS BROMOIDES, n. sp.

Perennis, vaginis dense pilosis, foliis linearibus, spiculis subcylindricis solitariis vel geminis sessilibus vel pedicellatis in paniculam elongatam ramis paucis simplicibus ascendentibus dispositis, gluma sterili exteriori in aristam longissimam scabram producta, reliquis oblongo-lanceolatis acutis.

A perennial, with slender cylindrical stems 1–$1\frac{1}{2}$ ft. long, ascending from a decumbent base. Leaves 3–4 in. long, $\frac{1}{6}$–$\frac{1}{4}$ in. broad, glabrous except towards the base; sheaths about an inch long, densely pilose both upon the surface and margin. Panicle 6–8 in. long, with a few very ascending long slender simple secund branches. Spikelets laxly disposed, usually solitary and sessile, $\frac{1}{6}$ in. long. Outer sterile glume oblong-lanceolate, 5-nerved, nearly as long as the spikelet, produced into a long awn; inner sterile glume just like the outer in shape and texture, but not awned. Flowering-glume oblong-lanceolate, acute, glabrous, just like the sterile glumes in texture, distinctly 5-nerved on the back.—*Baron* 3213! Nearly allied to *O. setarius*, Rœm. & Sch. (*O. acuminatus*, Nees).

ECHINOLÆNA MADAGASCARIENSIS, n. sp.

E. foliis magnis lanceolatis, vaginis margine ciliatis, spiculis dense spicatis,

rhachi applanata, glumis 4 oblongo-lanceolatis, exteriori pilis patulis basi bulbosis dense vestito, flosculo inferiori abortivo neutro.

Stems a foot or more long, slender, ascending, glabrous, terete, branched from the base. Sheaths of the numerous leaves about an inch long, densely ciliated all down the edge; blade thin, acuminate, glabrous, oblique at the base, 3–5 in. long, $\frac{1}{2}$–$\frac{5}{8}$ in. broad. Spikes terminal or axillary, peduncled, 1–1½ in. long, simple or compound at the base; rhachis flattened, produced into a long point at the top beyond the spikelets. Spikelets dense, unilateral, erecto-patent, ¼ in. long. Outer sterile glume oblong-lanceolate, acuminate, as long as the spikelet, densely clothed with firm spreading hairs with a bulbous base. Lower flower small, very imperfect. Upper flower with an oblong-lanceolate 5-nerved pilose flowering-glume ¼ in. long, and a pale of about the same length.—Diego Suarez, *Bernier*! (Herb Gay). It is fully described and figured by Gay in manuscript, but not named. The only other species of this curious genus is a plant of Guiana and Brazil.

PENNISETUM (§GYMNOTHRIX) TRITICOIDES, n. sp.

Perenne, dense cæspitosum, foliis lineari-setaceis erectis glabris elongatis vaginis apice ciliatis, spiculis solitariis erectis in spicam cylindricam dispositis, setis pluribus rigidis scabris valde inæqualibus unica reliquis longiori, glumis 2 exterioribus parvis ovatis, 3 oblongo-lanceolatis paleæ æquilongis.

A densely-tufted perennial, with stems 1–2 ft. long. Leaves ½–1 ft. long, linear, $\frac{1}{6}$ in. broad at the clasping base, tapering gradually upwards into a setaceous point. Spike simple, erect, cylindrical, 4–5 in. long, $\frac{1}{6}$ in. in diam. Spikelets solitary, erect, cylindrical, ¼ in. long, tapering to the point. Bristles a dozen or more, slender, rigid, distinctly ciliated, one much longer than the rest and about twice the length of the spikelet. Outer sterile glume very small, ovate; the other larger, about half as long as the spikelet. Outer flowering-glume oblong-lanceolate, acute, but not awned, firm in texture, pale green, glabrous, 5-nerved. Stigmas protruding from the tip of the closed spikelet. —*Baron* 683! 3239! 3294! *Parker*! Nearly allied to the Abyssinian *P. riparium*, Hochst.! Resembles in habit our European *Triticum caninum.*

PŒCILOSTACHYS GEMINATUM, *Hackel*.—In Sitz. Vien. Akad. Wissen. 1884, p. 131, Hackel has described a new endemic genus of

Madagascar grasses under the name of *Pœcilostachys*, one species of which is the plant I described in Journ. Linn. Soc. xx. p. 300 (Baron 1061, 3226) under the name of *Lophatherum geminatum*, and a second (*P. Hildebrandtii*, Hackel), founded on Hildebrandt's No. 3759.

ERAGROSTIS (§PTEROESSA) MAXIMA, *Baker*. — Megastachya maxima, *Bojer MSS.*

Erecta, robusta, foliis lanceolatis basi cordatis, spiculis 6–12-floris oblongis complanatis in paniculam amplam laxissimam rhomboideam dispositis omnibus pedicellatis, rhachilla continua, glumis sterilibus oblongis floriferis minoribus, glumis floriferis oblongis distichis lateralibus complicatis, paleis hyalinis ciliatis.

Stems erect, 2–3 ft. long. Leaves lanceolate, acuminate, thin in texture, 4–6 in. long, $\frac{1}{2}$–$\frac{3}{4}$ in. broad, cordate at the base; sheaths of the stem-leaves 2–3 in. long. Panicle erect, rhomboid, very lax, 6–9 in. long and broad; main branches erecto-patent; pedicels capillary, erect, $\frac{1}{4}$–$\frac{3}{4}$ in. long. Spikelets oblong, flattened, $\frac{1}{3}$–$\frac{1}{2}$ in. long; rhachis not articulated. Outer sterile glume not more than half as long as the flowering-glume. Flowering-glume oblong, $\frac{1}{8}$ in. long, glossy, drab, firm in texture, with flattened sides and a scabrous keel. Pale oblong, hyaline, about half as long as the flowering-glume, with a strongly ciliated margin. Caryopsis ovoid, brown, glossy.—*Baron* 2551! Gathered also long ago by Bojer. One of the most robust and ornamental species of the genus.

NASTUS CAPITATUS, *Kunth*.—*Baron* 2591!

CEPHALOSTACHYUM CHAPELLIERI, *Munro*.—Forest of Andrangaloaka, *Dr. Parker*! *Baron* 2564! Mr. Baron's specimens have heads composed entirely of the barren spikelets, and show well the reduced bract-like leaves, hairy inside, which conceal the heads in an early stage, and also the curious deciduous deeply fimbriated lanceolate ligules. The three Bamboos which Mr. Baron and Dr. Parker have collected all prove identical with species known previously.

FILICES.

LYCOPODIUM MEGASTACHYUM, n. sp.

Dendricolum, caule erecto subpedali dichotomiter furcato, foliis densis reflexis lanceolatis rigide coriaceis, costa ad faciem inferiorem perspicua, spicis 3–4nis magnis cylindricis pendulis simplicibus vel furcatis, bracteis ovatis ascendentibus coriaceis fructu longioribus.

A robust epiphytic species, with erect forked stems about a foot long. Leaves crowded, reflexed, rigid in texture, bright green, $\frac{1}{2}$ in. long, with the midrib not visible on the upper surface, but distinct beneath. Spikes 3–4 to a branch, pendulous, $\frac{1}{6}$ in. diam., sometimes 5–6 in. long. Bracts quite different from the leaves in shape and direction, uniform, ovate, multifarious, $\frac{1}{8}$–$\frac{1}{6}$ in. long, yellowish green, coriaceous. Capsule orbicular, $\frac{1}{16}$ in. diam.—*Baron* 2840! Belongs to the group of *L. Phlegmaria.* I do not think that *L. pachyphyllum,* Kuhn, founded on Hildebrandt's 4141 will prove to be distinct specifically from *L. obtusifolium*, Sw. It was also collected many years ago by Mr. W. Pool.

ALSOPHILA BARONI, n. sp.

Arborea, frondibus deltoideis tripinnatis utrinque viridibus præter costas pinnularum glabris, pinnis petiolatis oblongo-lanceolatis, pinnulis sessilibus lanceolatis, segmentis tertiariis lanceolatis integris, venis 8–10-jugis, inferioribus compositis, soris parvis globosis costularibus.

A tree-fern, with the habit of *A. australis* and *A. excelsa.* Rhachis of the pinnæ pale brown, unarmed, glabrous on the underside, clothed on the upper surface with minute red-brown crisped hair-like paleæ. Fronds moderately firm in texture, green above, pale green beneath. Pinnæ about a foot long. Pinnules crowded, $\frac{5}{8}$–$\frac{3}{4}$ in. broad, cut down to the paleaceous rhachis into distinct adnate arcuate-ascending tertiary segments $\frac{1}{12}$ in. broad, with reflexed edges; veins fine and indistinct, the lower with 3–4 branches, the central ones erecto-patent, deeply forked. Sori minute, globose, superficial.—*Baron* 3143!

The Orchids of Madagascar.

By HENRY N. RIDLEY, M.A., F.L.S., Assistant, Botanical Department, British Museum.

[Read 15th January, 1885.]

(PLATE XV.)

THE Orchideæ of Madagascar, as far as they are at present known to me, belong to 30 genera containing nearly 140 species; but it is to be expected that this number will be largely increased when the botanical riches of the country are more fully explored. This paper must therefore be only considered as a prodromus, giving an account of the species hitherto described or figured, together with those novelties which have come under my personal observation in the great herbaria of the British Museum and Kew.

It would at present be premature to base any arguments as to the origin of the flora of Madagascar upon the distribution of the genera and species of Orchideæ as at present known; but it will be of interest to examine the list and compare it with that of Africa and Tropical Asia.

The Epidendreæ are represented by 6 genera, two of which, *Oberonia* and *Cirrhopetalum*, are interesting from their absence from Africa, the remainder also being more extensively developed in Tropical Asia than in Africa. Of the Vandeæ there are 11 genera, four of which, so far as is certainly known, are confined to the Mascarene archipelago; one, *Polystachya*, is distributed over both hemispheres; the remainder are either exclusively African, as *Lissochilus*, or are most abundant in Southern and Tropical Africa, with outlying species in Southern Asia. The genus *Acampe*, however, is probably more of an Asiatic type than of an African one. The small number of Neottieæ gives somewhat of an African facies to the list. There are only 4 genera: one, *Gymnochilus*, is exclusively Mascarene; the others consist of the two widely distributed genera *Corymbis* and *Pogonia*, and *Monochilus*, which is chiefly Malayan. The Ophrydeæ are very well represented. There are eight genera, of which two are only known from Madagascar, viz. *Bicornella* and *Platycoryne*; one is found also in the other islands of the archipelago, viz. *Cynorchis*. Of the rest, two occur also in Africa; and two, *Disperis* and *Satyrium*, while occurring in India, are most abundant in Africa.

Thus, broadly speaking, we may say that the Epidendreæ are typically Asiatic, while the remainder are more of an African character.

As might be expected, a large proportion of the species are endemic; and but few have a distribution further than the archipelago or neighbouring coasts of Africa. The most widely spread species are *Cirrhopetalum Thouarsii*, perhaps the most widely distributed of all epiphytic Orchids, extending its range as far east as the Society Islands, and *Corymbis corymbosa*, which is found also in West Africa.

OBERONIA.

O. BREVIFOLIA, *Lindley, Gen. et Sp. Orch. Pl.* p. 16; *Folia Orchid.* no. 36; *Ad. Brongniart, Voy. 'Coquille,'* t. 40 B; *S. Moore, in Fl. Maur. & Seych.* p. 341.—Cymbidium equitans, *Thouars, Orch. Iles Afriq.* t. 92.—Pleurothallis disticha, *A. Richard, Orch. Maur.* t. 8. fig. 1; *Bojer, Hort. Maur.* p. 319.—Malaxis brevifolia, *Reichenbach fil., Otia Hamburg.* ii. p. 73.

Madagascar, Imerina, *Deans Cowan*! Mauritius, *Wallich*! *Sir James Macgregor*! *in Herb. Brit. Mus.* Rodriguez, *Balfour, Transit-of-Venus Expedition*, no. 1223!; *Herb. Brit. Mus.* Bourbon. Comoro Islands, Johanna, at 1000–1400 metres, *Hildebrandt* no. 1709.

This little plant appears to be widely distributed over the East-African islands. I have not seen it, however, from the main land. It is the most western species of the genus, which has its headquarters in Tropical Asia, especially India, and has outlying species also in Australia, New Zealand, and Polynesia.

The stem varies from less than 1 inch in height to 3 inches, and is covered with equitant leaves, often as much as 1½ inch long. The raceme is sometimes short and erect; at others long, slender, and nodding, attaining a length of 4 inches. The bracts are as long as the ovary in the flower; but in fruit the pedicel as well as the ovary lengthens, so that the bract is then only as long as the pedicel. The flowers are very minute, yellowish green.

LIPARIS.

The genus *Liparis* has a distribution only surpassed among Orchids by *Habenaria*. The headquarters of the genus is to be found in Tropical Asia. None of the Madagascar species are known outside the Mascarene archipelago, and all but one belong to the section Mollifoliæ.

Liparis cæspitosa, *Lindley, Bot. Reg.* sub t. 882; *Gen. et Sp. Orch. Pl.* p. 32; *A. Richard, Orch. Maur.* p. 53; *Bojer, Hort. Maur.* p. 321; *S. Moore, in Flora Maurit. & Seych.* p. 342.—Malaxis cæspitosa, *Thouars, Orch. Iles Afr.* t. 90.—L. angustifolia, *Lindley, Orch. Pl.* p. 31.—Malaxis angustifolia, *Blume, Bijd.* p. 393.

Madagascar, Imerina, *Deans Cowan.* Mauritius, *Bojer, Herb. Brit. Mus.*; *Bouton.* Bourbon, *Bernier, Herb. Kew.* Java, *Forbes*, 914. Sumatra, *Forbes* no. 2574 *b* (pars). Ceylon, *Thwaites* no. 2351 *in Herb. Brit. Mus.*

This little plant is allied to *L. viridiflora.* It is generally about 3 inches or 3½ inches in height. The leaf 1½–2 inches in length, and 2 lines across in the broadest part. The flowers are given as white in Thouars's drawing; but in the dried specimens they appear greenish. I cannot distinguish the Mascarene plant from the Malayan *L. angustifolia.*

L. lutea, n. sp.—Terrestris semipedalis, caule basi dilatato, foliis lanceolatis; scapo gracili tri- vel plus vaginato; racemo laxiusculo, floribus parvis flavis 8, rhachidi appressis; bracteis ovatis lanceolatis acuminatis, ovarii dimidio æquantibus; sepalo postico angusto lineari obtuso, lateralibus ovatis falcatulis, labellum paullo superantibus; petalis linearibus quam sepalum posticum multo angustioribus et longioribus, labello ovato cordato obtuso, in medio venis tribus; columna brevi crassiuscula, parum curva.

Ankafana, in palude, rara, *Deans Cowan.*

This plant attains the height of 6½ inches. The leaves are 2 inches long by ½ an inch across. The flower-spike is erect, rather stiff; the flowers are not patent, but appressed to the raceme, small, bright yellow. The column is short and rather thick, two thirds of the length of the dorsal sepal.

L. bicornis, n. sp.—Terrestris, pseudobulbis nullis; foliis 3–5 lanceolatis acutis erectis; caule semipedali foliato, floribus circa 12, in apice caulis aggregatis; bracteis linearibus lanceolatis acutis, ovarium subæquantibus; sepalo postico oblongo lanceolato obtuso, lateralibus ovato-lanceolatis obtusis; petalis linearibus obtusis; labello obcuneato emarginato, marginibus lateralibus incrassatis, callo bicornuto parvo ad basin; columna quam labellum breviore crassa, parum curva, basi et apice incrassata, alis parvis; anthera ovata obtusiuscula.

Imerina, in paludibus, *Hildebrandt* 3849! *in Herb. Brit. Mus.*

A rather small-flowered species with narrow erect leaves, a stem 7 to 8 inches in height, and a rather compact spike of about twelve flowers with stout pedicels. The column is rather stout and but little curved except at the upper part. The lip is obovate-cuneate, and emarginate, with a depression in the middle of its length, the edges at the base turning up flank the column; there is a small two-horned callus close under the lower part of the column.

LIPARIS LONGIPETALA, n. sp.—Terrestris, pseudobulbis ovatis parvis crassis; vaginis membranaceis albis tectis, foliis duobus lanceolatis acutis; caule semipedali folia superante; bracteis 7–10 remotis, inferioribus lanceolatis acutis brevibus, superioribus ovatis acutis vix dimidium ovarii æquantibus; floribus remotis, pedicellis tenuibus; sepalo postico late lineari subacuto, lateralibus semiovalibus falcatis; petalis anguste linearibus longis, apice parum dilatatis, labello quam sepala multo breviore, oblongo, brevissime mucronato, basi angustato, callo parvo obtuso; columna brevi, basi angusta recta, parte summa curva, alis brevibus latiusculis acutis.

In sylvis Ankafana, S. Betsileo, *Hildebrandt*, March 1881, no. 3980! *in Herb. Brit. Mus.*

A smaller plant than the two preceding, with fleshy ovate pseudobulbs and lanceolate leaves gradually tapering to the base, 2½–4 inches in length, ½ an inch broad in the broadest part. The stems are 5 inches in length, with from 7 to 10 scattered bracts. The flowers are smaller than those of the preceding, and 6 or 7 in number, with pedicels 4 lines in length. The lateral sepals are almost semicircular, 2 lines in length, the two together forming a circle; the narrow petals are just twice as long. The lip is much shorter than the lateral sepals, oblong, with a very short blunt process in the centre of the broad apex; the base is much and suddenly narrowed, and in the middle line just below the apex of the anther is a short obtuse callus, apparently of an orange colour. The column is rather short and but little curved; the lateral wings extend but a short way along the column, but are rather broad and pointed, coming to a point in the middle.

The apex of the anther is more acute than that of the two preceding species.

Liparis flavescens, *Lindley, Bot. Reg.* sub t. 882; *Orch. Pl.* p. 29; *Ach. Richard, Orch. Maur.* p. 51; *S. Moore, Fl. Maur. & Seych.* p. 342.—Malaxis flavescens, *Thouars, Orch. Iles Afr.* t. 25.

Terrestris semipedalis, rhizomate diu repente, caule ebulboso basi vaginis membranaceis tecto; foliis congestis ovatis petiolatis 1½ uncia longis, ¾ uncia latis, flaccidis; racemo paucifloro; sepalo postico anguste lanceolato, lateralibus ovato-lanceolatis falcatis; petalis linearibus; labello rotundato lato integro cuspidato, costis in medio tribus, ungui brevi; anthera ovata.

Madagascar, *Lyall*! *in Herb. Kew.* Also found in Mauritius (*Bojer*), Seychelles (*Horne*), and Bourbon.

This plant has a long creeping rhizome, throwing up stems about 7 inches in height including the scape, with tufted ovate leaves.

L. ornithorrhynchos, n. sp.—Terrestris, rhizomate repente; pseudobulbis nullis; caule erecto semipedali, parte inferiore vaginis albis membranaceis tecta; foliis duobus, rarius tribus, ovatis acutis breviter petiolatis; floribus mediocribus 3–12 remotis, pedicellis semiuncialibus; bracteis ovatis lanceolatis, superioribus lanceolatis acutis; sepalo postico lineari, lateralibus deflexis ovato-lanceolatis obtusis falcatis; petalis linearibus angustis, apice parum dilatatis; labello late cordato integro, ecalloso, basi angustato; columna paullo curva, basi angustata, alis latioribus longis; anthera ovata rostrata.

Ankafana, S. Betsileo, in sylvis, 4049 *Hildebrandt*; *Deans Cowan in Herb. Brit. Mus.*

This terrestrial *Liparis* has some affinity with *L. Bowkeri*, Harvey, a Cape plant. The lower part of the stem, about 2 inches, is covered with white membranous leaf-sheaths; above these are the leaves, generally two in number, ovate, with rather short petioles; they are 5-ribbed, and 2 inches in length by 1 in diameter. The flower-spike is rather lax, and bears from 3 to 12 light-green flowers, rather large in size for a *Liparis*; their pedicels about ½ an inch. The linear dorsal sepal is 5 lines in length, twice the length of the column. The lateral sepals are somewhat similar in shape to those of *L. Bowkeri*, rather broad and falcate, 4½ lines in length. In one specimen they were connate for a portion of their length, but separate at each end. The lip was broadly cordate, 5 lines long, base narrowed; a rather broad bar runs down the centre, but there are no callosities. The column is almost straight, but slightly curved in the base, the wings flanking the stigma. The anther is provided with a rather long green beak.

LIPARIS LONGICAULIS, n. sp.—Terrestris, rhizomate repente; caule pedali, parte inferiore (5-unciali) vaginis albis membranaceis tecta; foliis ovatis acutis breviter petiolatis, caulinis ovatis acuminatis; floribus paucis ad 6 remotis majusculis; bracteis lanceolatis, $\frac{1}{2}$–$\frac{1}{3}$ pedicellorum æquantibus; sepalo postico lineari obtuso longo, lateralibus ovatis lanceolatis obtusis falcatis, margine interiore irregulariter crenulato, venis conspicuis; petalis angustissime linearibus; labello integro oblongo obtuso crenulato, quam sepala multo breviore, venis conspicuis, callo biconico obtuso parvo; columna longiuscula arcuata gracili, alis parvis tenuibus; anthera ovata, apice obtusa.

Ankafana, in sylvis, *Hildebrandt* no. 3979!; *Deans Cowan in Herb. Brit. Mus.*

This is allied to *L. ornithorrhynchos*, differing in the longer basal portion of the stem covered with whitish membranous sheaths, the oblong lip with crenulate edge, and the curved slender column. The flowers are olivaceous green. The narrow dorsal sepal is 8 lines, the laterals 7 lines, and the lip 5 lines in length.

L. OCHRACEA, n. sp.; rhizomate breviter repente, caule basi bulboso, 2-unciali; foliis circiter 5, ovatis vel ovatis-lanceolatis, scapo paucifloro, floribus majusculis; bracteis ovatis acuminatis, caulem amplectentibus, ovario ferme æqualibus; sepalo postico lineari, lateralibus oblongis quam labellum longioribus; petalis linearibus quam sepalum posticum angustioribus; labello basi angustato longo, lamina abrupte deflexa oblonga truncata; columna brevi curva crassiuscula.

Ankafana, *Deans Cowan* (*vidi iconem pictam*).

This plant differs from *L. ornithorrhynchos*, to which it is closely allied, in the bulbous base of the stem and short rhizome, the more numerous leaves, 4 inches in length by 2 inches in diameter, and the shape of the lip, which has a rather long narrow base and an oblong truncate lamina which is abruptly deflexed. The flowers are olivaceous ochraceous, the lip having a dark ochreous patch in the middle of the lamina. I have only seen a very good coloured drawing of this plant made by Deans Cowan.

There is no specimen in his herbarium. The whole plant appears to be about 5½ inches in height.

Liparis parva, n. sp.—Epiphyta parvula pseudobulbo parvo elongato; foliis paucis lanceolatis vel ovato-lanceolatis; caule gracili paucifloro; bracteis ovatis, ovarii trientem æquantibus; floribus parvis olivaceis; sepalo postico lineari, lateralibus lanceolatis falcatis obtusis; petalis linearibus, basi angustioribus; labello integro ovato obtuso; columna crassiuscula semitereti ferme recta, alis brevibus.

Trees, Ankafana, *Deans Cowan! in Herb. Brit. Mus.*

L. connata, n. sp.—Terrestris, caule ebulboso; foliis ovatis petiolatis congestis flaccidis, scapo brevi multifloro; bracteis lanceolatis acutis, flores superantibus; floribus mediocribus; sepalis connatis ovatis obtusis, nervis conspicuis; petalis linearibus 3-nerviis, angustis obtusis; labello oblongo-elliptico, venis prominulis rufescentibus (in sicco) præsertim duabus medianis ad bases quorum calli cornuti duo, labelli marginibus crenulatis; columna curva graciliuscula, alis brevibus acutis.

Imerina, *Deans Cowan! in Herb. Brit. Mus.*

It is possible that this plant is a monstrous state of some other *Liparis*; but all the flowers I examined on two plants seemed in the same state. Those, however, on one of the two plants were in a very young state. The bud appears to open along the upper part where the posticous sepal should be. The other two sepals form an ovate-obtuse organ bifid at the apex, the line of demarcation between them (a white nerve) being conspicuous; but I could see no trace of the posticous sepal. The veins on the perianth-segments are red and very conspicuous, especially those on the lip, two of which, running along the whole length, are very well marked, and terminate at the base in two short horn-like calli. The whole plant is about 9 inches in height, the leaves 3 inches long by 1½ inch across. The flowers appear to be reddish, and are doubly saccate at the base. The leaves are also apparently tinted with red.

Bulbophyllum.

A large genus distributed over the tropics of both worlds, being especially abundant in Tropical Asia. Besides the species here described, there are among Deans Cowan's drawings figures of several apparently nondescript, but of which specimens do not occur in the herbarium.

Bulbophyllum nutans, *Thouars, Orch. Iles Afriq.* t. 107; folio t. iv.; *Lindley, Gen. and Sp. Orch. Pl.* p. 52; *Richard, Orchid. Maur.* p. 63; *S. Moore in Fl. of Maur and Seych.* p. 345.

Madagascar, *fide Thouars*; Ankaratra montes, *Rutenberg.* Mauritius, *Ayres, Herb. Kew.* Ins. Mascarenes, *Sir J. Macgregor in Herb. Brit. Mus.*

B. multiflora, n. sp.; pseudobulbis quadrato-cylindricis, semiuncialibus, vaginis membranaceis tectis, nitidis rugosis flavis monophyllis; folio lanceolato obtuso, apice bilobo, coriaceo; racemo denso nutante longo gracili; floribus brevissime pedicellatis copiosis flavescentibus; bracteis membranaceis lanceolatis vel superioribus ovatis, acutis, ovarium superantibus; sepalis linearibus lanceolatis acutis; petalis oblongis lanceolatis; labello unguiculato, lobo medio brevissimo carnoso linguiformi curvo, medio depresso marginibus evectis; columna brevi crassiuscula, dentibus clinandrii brevibus obtusis, antheram vix superantibus; anthera ovata depressa.

Imerina, Ankafana, "on trees in great clusters, often covering the whole tree," *Deans Cowan* ! *in Herb. Brit. Mus.*

B. Baronii, n. sp.; rhizomate longo lignoso; pseudobulbis dissitis oblongis flavis rugosis (siccis), monophyllis; foliis oblongis obcuneatis obtusis, bilobis erectis; scapo longiusculo basi vaginis membranaceis tecto, racemo laxo, floribus pluribus parvis; bracteis ovatis obtusis vel subacutis, ovario æquantibus; sepalis ovato-lanceolatis; petalis lanceolatis obtusis multo minoribus; labello ovato subacuto, curvo marginibus erectis minimo; columnæ dentibus brevibus obtusis.

Andrangaloaka, E. Imerina, apud truncos arborum, floribus flavis, *Hildebrandt* no. 3728 ! Ankafana, *Deans Cowan* ! Central Madagascar, *Baron* no. 1176 ! *in Herb. Brit. Mus.*; *Baron* 714, *Herb. Kew.*

This plant is nearly allied to *B. nutans*, Thouars, for which it has been mistaken. It is easily distinguished by its elongate pseudobulbs, half an inch in length, bearing only one rather long leaf, 2, more rarely 3, inches in length by $\frac{1}{4}$ in diameter, and more erect scape $3\frac{1}{2}$ inches or less in length. The flowers are small, about twenty in number.

B. minutum, *Thouars, Orch Iles Afr.* t. 110; *Lindley, Gen. and Sp. Orch. Pl.* p. 52.

Madagascar, *Thouars*.

I have not seen this plant, and only know it from Thouars's figure; it approaches *B. Thompsonii*, especially in the shape of the column-teeth. The whole plant is about 4 inches in height; the leaves, 4 lines in length, are called oval by Thouars, but are rather oblong in the figure.

Bulbophyllum Thompsonii, n. sp.; pseudobulbis ovato-globosis monophyllis rugosis nitidis, in rhizomate dissitis; folio oblanceolata obtuso coriaceo triunciali; scapo nutante 4-unciali, vaginis 5, albis membranaceis; racemo compacto; bracteis parvis ovatis acutis, ovarii dimidio æquantibus; floribus parvis ad 20; sepalis subsimilibus deltoideis acutis; petalis linearibus acutis, subspathulatis dimidio sepalorum æquantibus; labello oblongo-lanceolato acuto carnoso flavo, apice fasce pilorum minuto; columna brevi crassa, dentibus erectis longis acutis; capsula ovata oblonga sessili.

Madagascar, *Thompson! in Herb. Brit. Mus.*

This plant is allied to *B. nutans*. Its leaf is 3 inches in length by 1 across; the scape is 4 inches high.

B. erectum, *Thouars, Orch. Iles Afriq.* t. 96; *Lindley, Gen. and Sp. Orch. Pl.* p. 53.

I have seen no plant answering exactly to Thouars's figure, which seems to be allied to the last species, differing however in the short teeth of the column, shape of lip, and colour. It does not appear to have been found elsewhere.

There is a drawing of a *Bulbophyllum* among Deans Cowan's sketches which much resembles *B. clavatum*, Thouars, a species not yet recorded from Madagascar, but differing in having but one leaf to the pseudobulb instead of two. It was found at Ankafana.

B. Hildebrandtii, *Reichenbach fil., Otia Hamb.* fasc. 2, p. 74, Beravi Mountains, *Hildebrandt*, no. 2988 *a*, I have not seen. Its affinity is stated to be with *B. incurvum*, Thouars.

B. occlusum, n. sp.; rhizomate valido lignoso; pseudobulbis aggregatis paucis oblongis in vaginis magnis celatis diphyllis; foliis lanceolatis spathulatis coriaceis striatis semipedalibus, quam scapum vix brevioribus; scapo crassiusculo 1–2 vaginato; racemo nutante, bracteis magnis triangularibus, circiter 9, flores ferme includentibus; sepalis triangularibus acutis, lateralibus ad basin connatis; petalis spathulatis mucronatis, apice hirtis, sepali dimidio æquantibus; labello unguiculato, basi ad sepalos laterales adnato, lobo medio linguiformi carnoso, costis tribus carnosis hispidis; columna brevi crassa; dentibus clinandrii erectis longis acutis; anthera depressa, apice acuta.

Madagascar, Ankafana, *Hildebrandt* no. 3985! *in Herb. Brit. Mus.*

This plant is closely allied to *B. occultum*, Thouars, and *B. variegatum*, Thouars, natives of Mauritius and Bourbon, which have not yet been recorded from Madagascar. It differs from those species in the fewer and more distant bracts, and the larger, apparently purple flowers, the broader lip, and acute long teeth of column. The leaves are stiff and hard, 6 inches in length by ¾ inch in the broadest part. The scape is about the same length, bears a nodding raceme of about 9 flowers.

CIRRHOPETALUM.

C. THOUARSII, *Lindley, Gen. and Spec. Orch. Pl.* p. 58; *Bot. Reg.* 1838, t. ii.; *Bot. Mag.* t. 4237 (*reproduced also in Moore's Illustrations of Orchideous Plants*, Cirrhopetalum, t. iii.).—Bulbophyllum longiflorum, *Thouars, Orch. Iles Afr.* t. 97, 98; *Reichenbach fil. in Walp. Ann.* vi. 260; *S. Moore in Flora Maurit. et Seych.* p. 346.—Epidendrum umbellatum, *Forster, Prodr.* p. 321.—Cymbidium umbellatum, *Sprengel, Syst. Veget.* iii. p. 723.—Zygoglossum umbellatum, *Reinwardt, Syll. Pl. Soc. Ratisb.* ii. 4.

Madagascar, *Thouars.* Mauritius, *Thouars, Bojer.* Bourbon, *Capt. Carmichael*! *in Herb. Brit. Mus.* Java, *Reinwardt.* Manilla, *Cuming.* Society Islands, *Matthews*; Otaheite, *Forster*! *Collie*! (*in Beechey's Voyage*) *in Herb. Brit. Mus.*

The petals and dorsal sepal in the East-Asiatic form are yellow with brown spots; the lateral sepals cinnamon or tawny, the inner side dotted with red-brown; but in Thouars's figure the dorsal sepal and petals are coloured green, the column and lip pink, the lateral sepals white. Perhaps there is some mistake in this colouring, for in the synopsis, he says under petals, "tr. long. rouge obscur." He also represents the fruit as pendulous and stouter than in the Polynesian plant, in which it is generally at least erect when ripe. The leaf in the Mauritian plants seems to be narrower than that of the Polynesian variety.

The remaining species of the genus are East-Indian, with outlying species in China and Australia.

CALANTHE.

This genus extends over the tropics of the Old and New World, being most abundant in the Indo-Malayan region. The only recorded species from the Mascarene Islands is found also in Natal.

CALANTHE SYLVATICA, *Lindley, Gen. and Sp. Orch. Pl.* 250; *Fol. Orch.* no. 15; *Reichb. f. in Walp. Ann.* vi. 914; *S. Moore, Fl. Maur. et Seych.* p. 363.—C. versicolor, *Lindley, Sertum Orchid.* t. 42; *Fol. Orch.* no. 16.—Centrosis sylvatica, *Thouars, Orch. Iles Afr.* tt. 35, 36.—Centrosia Auberti, *Rich. Orch. Maur.* 45, t. 7. f. 3.—Bletia sylvatica, *Bojer, Hort. Maur.* 318.

Madagascar, *Thompson*! Imerina, *Deans Cowan*! Mauritius, *Sieber, Fl. Maur.* 170! *Herb. Brit. Mus.*; *Bojer, Gardner, Herb. Kew.*

It occurs also in Bourbon, S. Africa, and the Seychelles. The whole plant is about 1 foot or 15 inches high. The leaves from 3 inches to 9 long, about 2 across. The spur 1 inch long.

PHAIUS.

All the Mascarene species of this genus belong to the section *Gastrorchis*, Blume, which are distinguished by the saccate, ventricose, not spurred, base of the labellum, which is also usually shorter and broader and more open than in the remainder of the genus. The petals and sepals are also usually broader.

The genus is distributed over the tropics of the Old World, and in China and Japan. The Mascarene species are:—*Ph. villosus*, Reichb. f., Mauritius; *Ph. tetragonus*, Reichb. f., Mauritius and Seychelles; *Ph. stuppeus*, Blume, Bourbon; *Ph. tuberculosus*, Blume, *Humblotii*, Reichb. f., and *Ph. pulchellus*, Kranzlin, Madagascar.

PH. TUBERCULOSUS, *Blume, Orchid. Archipel. Ind.* p. 13; *Gard. Chron.* March 1881, p. 341 (xylogr.); *Garden*, July 1884, p. 46. —Limodorum tuberculosum, *Thouars, Orch. Iles Afr.* t. 31.— Bletia tuberculosa, *Sprengel, Syst. Veget.* iii. 744; *Lindley, Gen. and Spec. Orch. Pl.* p. 143.

Madagascar, endemic, *Thouars*! *in Herb. Brit. Mus.*

It has been introduced into cultivation, but comparatively seldom flowers. In Thouars's figure the flowers are given as entirely pink, which is at variance with those of the plants flowered in this country.

PH. HUMBLOTII, *Reichenbach fil. in Gard. Chron.* 1880, ii. p. 812. —Planta tripedalis, rhizomate repente; foliis late lanceolatis plicatis pedalibus; racemo laxo; bracteis ovario duplo brevioribus, anceolatis caducis; floribus speciosis; sepalis angustioribus ovatis lanceolatis roseis; petalis ovatis obtusis; labello brevi ecalcarato lato trilobo, lobis lateralibus evectis rotundatis marginibus minute crenulatis, lobo medio retuso, apice recurvo; callo bicorni carnoso, basi hispido; columna elongata gracili curva; polliniis 8.

Ankafana, in damp shade on the ground in the lower part of the forest, *Deans Cowan*; same locality, *Hildebrandt* no. 3984 *in Herb. Brit. Mus.*

A very handsome plant belonging to the spurless group, and remarkable for the shortness of the lip. The leaves are a foot long by 3 inches broad, gradually tapering to the base; the stems bear racemes of about 13 flowers. The sepals and petals are rose-pink; the lateral lobes of the labellum are yellow with pink spots, the middle lobe pink with a yellow centre; the callus, which consists of two slightly curved diverging horns, is yellow; in front of it lies a patch of yellow hairs; the column is also yellow and the bracts brown.

The plant was introduced into cultivation by Leon Humblot.

PH. PUCHELLUS, *Kranzlin, Verhandl. Brem.* vii. p. 254, I have not seen. It was obtained at Ambaravambato by Rutenberg.

VANDEÆ.

EULOPHIA.

This genus, which is most abundant in the Cape and tropical Africa, extending also to India and Malaya, is very well represented in Madagascar.

All the Madagascar species known to me belong to the section *Genuinæ*, in which the flowering scape is leafless, *i. e.* bears only sheathing-leaves, and springs from the side of the leaf-bearing pseudobulb. In most the leaves appear not to attain their full development till after flowering. In one species, *E. beravensis*, Reichb. f., the leaves are borne at the top of a tall stiff stem, naked except for a few sheathing-leaves. Most of the species are terrestrial, but at least one is epiphytic. Out of the nine species all but one, a native also of Mauritius, are endemic. The flowers are usually yellow, plain or variously marked.

E. VAGINATA, n. sp.—Terrestris; foliis gramineis linearibus acutis recurvis quam scapus brevioribus; scapo basi vaginis membranaceis pluribus ampliatis albescentibus tecto, caulinis acuminatis;

racemo laxiusculo; bracteis quam ovaria paullo brevioribus linearibus acuminatis; floribus mediocribus; sepalis lanceolatis; petalis ovatis obtusis brevioribus et latioribus; labello parvo, petalis subæquante, trilobo, lobis lateralibus ovatis obtusis, medio cuneato apice lato obtuso, lamellis tribus, duabus cristatis elevatis, intermedia minus elevata integra, calcare brevi conico-cylindrico recto; columna brevi, apice dilatato, stigmate grandiusculo ovato.

Ankaratra montes, apud colles gramineas, Jan. 1881, *Hildebrandt* no. 3864! *Herb. Brit. Mus.*

This species is allied to *E. reticulata.* The leaves are 8 inches in height, the scape one foot.

EULOPHIA PILEATA, n. sp.—Gracilis, pseudobulbis elongatis; radicibus crassis longis albis; foliis anguste linearibus longis plicatis; scapo elato gracili, basi vaginis paucis tecto, racemo laxiusculo; floribus mediocribus; bracteis membranaceis brevissimis linearibus acuminatis; pedicellis gracilibus; petalis sepalisque ligulatis obtusis subsimilibus; labello oblongo, lobo medio profunde emarginato, carinis duabus e basi labelli orientibus; calcare recto obtuso cylindrico-conico; columna parva oblonga exalata recta; stigmate obtuse triangulari; anthera conica bicornuta, cornubus recurvis, apicibus fuscis.

Ankafana, Nutongoa, *Deans Cowan.*

A rather tall and slender plant, with a scape of 20 inches in height, long narrow leaves 12 inches long and ¼ across, and a loose raceme of about 20 rather small flowers, orange-yellow in colour, with reddish streaks. The petals and sepals are very similar in shape, but the former have 3 veins distinct in the dry state, not visible in the sepals. The lip is rather broad and oblong, with two ridges highest at the base and gradually tapering away towards the median lobe, which is deeply notched. The column is rather small and narrow with straight sides. The form of the anther is rather remarkable; it is conical, the apex bifid, forming two recurved horns, each terminated by a dark-coloured knob, the whole resembling a Phrygian cap. The pollen-gland is short and triangular. The roots are remarkably long, thick, and corky. After flowering, the ripening fruits become deflexed according to Deans Cowan's drawing.

E. SCRIPTA, *Lindley, Gen. and Spec. Orch. Pl.* p. 182; *S. Moore in Flor. Maur. et Seych.* p. 359.—Limodorum scriptum, *Thouars, Orch. Iles Afriq.* tt. 46, 47; folio plate ii.; *Rich. Orch. Maur.* 48; *Bojer, Hort. Maur.* p. 313.

Madagascar, *Forbes*! Bourbon, *Capt. Carmichael*, Nov. 1813, *in Herb. Brit. Mus.* Mauritius, *fide Bojer*. Insula Mascarenes, *Sir J. Macgregor*!

There is also an unlocalized specimen from Thouars's Herbarium in the British Museum, of what seems to be *Limodorum concolor*, made by S. Moore a variety of *E. scripta*, Lindley; and except for the coloration I can really see no difference.

The rhizome is, in one of the Bourbon specimens, very stout and thick and covered with a dense mass of the fibrovascular bundles of the old leaves. The longest leaves I have seen are from 2 to 3 inches in length and narrow, but Richard, *l. c.*, gives them 8 to 9 inches long and 1 across, and S. Moore $6\frac{1}{2}$ inches long by $\frac{1}{3}$.

The scape attains a length of nearly 2 feet. The lower bracts are $\frac{1}{2}$ an inch long, the pedicel of the flower 1 inch, the ovary $\frac{1}{2}$. The flowers are an inch across, yellowish green with large purple spots. S. Moore describes two forms—one, male, with slender curved column; the other, female, with a stout straight column and rudimentary anther.

EULOPHIA MADAGASCARIENSIS, *Kranzlin, Verhandl. Bremen*, vii. p. 255, I have not seen. It was obtained by Rutenberg on the shores of Lake Itasi, and near Antananarivo.

E. RUTENBERGIANA, *Kranzlin, Verhandl. Bremen*, vii. p. 255.

Imerina in paludibus, *Hildebrandt* no. 3842 *in Herb. Brit. Mus.*! prope Antananarivo, vulgaris, *Rutenberg*.

The plant collected by Hildebrandt seems to be identical with that described by Dr. Kranzlin, an original specimen of which, however, I have not seen. He states that it has a large spathaceous basal leaf 5–6 centimetres in length, bifid at the apex. This is wanting in Hildebrandt's specimens, which, however, lack almost all of the pseudobulb. The plant is allied to *E. ensata*, Lindley. The flowers are yellow, the lateral lobes of the lip purple at the apex. The compact conical raceme with comose bracts, connivent perianth, and bearded lip, with two low ridges on the disk between the lateral lobes, distinguish it from the other Mascarene species.

E. GALBANA, n. sp.—Epiphytica; pseudobulbis ovoideis flavis nitidis; foliis paucis angustis linearibus lanceolatis acutis plicatis, scapum superantibus; scapo 7-unciali, vaginis 6 membranaceis

pallidis ampliatis, acuminatis instructo; racemo 10-floro; bracteis minimis ovato-lanceolatis membranaceis; sepalis petalisque conniventibus subsimilibus ovato-lanceolatis acutis flavis; petalis parum minoribus et obtusioribus; labello parvo tenui quam sepala breviore trilobo, lobis lateralibus parvis obtusis, medio oblongo ovato obtuso barbatulo, flavo ochreo-maculato; calcare nullo.

Rara in arboribus Ankafana, *Deans Cowan in Herb. Brit. Mus.*

This species is allied to *E. ensata*, Lindley, a native of Sierra Leone, but differs in the absence of spur, fewer flowers, and less bearded lip. The bases of the sepals and petals are prolonged backwards and downwards, so as to form a short gibbosity, in which, however, the lip takes no share. The small lip is narrowed at the base, and its lateral lobes, when spread out, are curved outwards at the apices; the median lobe is slightly bearded in the middle. The flowers are greenish yellow, and seem never to open widely; the lip is yellow as if stained with ochre.

The description is taken from a single specimen and an excellent coloured drawing by Deans Cowan.

Eulophia ramosa, n. sp.; scapo paniculato, ramis gracilibus, bracteis lanceolatis acutis; floribus pluribus, *E. concoloris* subæqualibus; sepalis petalisque ligulatis subspathulatis, basi angustatis, patentibus; sepalis longioribus versus apicem dilatatis; labello angusto recto trilobo, lobis lateralibus oblongis, marginibus exterioribus rectis integris, apicibus obtusis crispis, lobo medio oblongo ovato, apice emarginato, marginibus crispis, in medio cristis tribus brevibus; calcare conico obtuso curvo pendulo brevi; columna crassiuscula brevi; stigmate oblongo ovato.

Ankafana, *Deans Cowan.* Madagascar, no special locality, *Hilsenberg* and *Bojer.*

E. **beravensis**, *Reichenbach fil.*, *Otia Hamburg.* fasc. ii. p. 74.—Collected at Beravi, "in collibus arenosis in umbrosis fruticetorum, Juli 1879," *Hildebrandt* no. 3055! Forms according to Professor Reichenbach the type of a new section of the genus, distinguished by the leaves not springing from the pseudobulb as in the rest of the genus, but from the summit of a cylindrical stiff bare stem, which in the specimen in the British Museum herbarium is about a foot in height. The flowers are not larger than those of *E. pulchra.*

E. **reticulata**, n. sp.; rhizomate repente, radicibus validulis albis, foliis paucis teretibus acutis; scapo erecto, basi vaginis ampliatis membranaceis tecto, bracteis acutis; floribus paucis in racemo laxo; sepalis ovato-lanceolatis mucronatis; petalis ovatis obtusis latioribus, omnibus patentibus venis reticulatis; lobis labelli lateralibus parvis ovato-obtusis, medio majore obcuneato obtuso, basi angustata, marginibus crispis, venis conspicuis, cristis 7; calcare brevi cylindrico crassiusculo obtuso; columna brevi crassa; anthera plana patelliformi oblonga; polliniis subglobosis.

Ad flumen Sassak prov. Imani, *Hilsenberg*! *in Herb. Brit. Mus.* "Tandrooka-ondri-taki" incolarum.

The scape is about one foot in height, covered at the base with loose membranous sheaths; the lower ones ovate, those on the higher portions of the scape more pointed. The leaves appear to be terete, but in the only specimen which I have seen are in bad condition; the largest is 5 inches long. The flowers are rather bigger than those of *E. scripta* and open wide. The narrow linear-lanceolate acuminate bracts are half the length of the ovary. The petals and sepals are curiously veined in a reticulate manner; the former are a little shorter and considerably broader than the latter, but the difference is hardly sufficiently marked to cause me to refer it to the genus *Lissochilus*. The central lobe of the lip is large in proportion to the rest, and decorated with 7 crests or raised notched ridges. The pollinia are more circular in outline than usual; each has a semilunar depression at the back.

LISSOCHILUS.

Only two species of this African genus have as yet been met with in Madagascar, and none are known from the other islands of the archipelago. I have seen neither of the species which were collected by Rutenberg and described by Dr. Kranzlin under the names of *L. madagascariensis* and *L. Rutenbergianus* in the Verhandl. Bremen, vii. pp. 256, 257.

CYRTOPODIUM.

This genus is represented by a single species, occurring in all the larger of the Mascarene Islands The remaining species of the genus are scattered over the tropics of America, Africa, and Indo-Malaya.

C. PLANTAGINEUM, *mihi.*—Cyrtopera plantaginea, *Lindley, Gen. and Spec. Orch. Pl.* p. 189; *S. Moore in Fl. Maur. & Seych.*

p. 361.—Limodorum plantagineum, *Thouars, Orch. Iles Afr.* tt. 41, 42; *Bojer, Hort. Maur.* p. 313.

Madagascar, *Forbes*! Ankafana, *Hildebrandt* no. 3986! same locality and Fiarantosoa, *Deans Cowan*! *in Herb. Brit. Mus.* Mauritius, *fide Bojer*. Bourbon.

This conspicuous plant seems to be most nearly allied to *C. bicolor* (*Eulophia bicolor*, Blume), from which it differs in the broader white petals and narrower leaves and colouring of the lip. The sepals are spreading, green; the petals broader and shorter, parallel with the column, white; the lip green, except the median lobe, which is white with rose-coloured crests. The spur is pinkish green. Deans Cowan, in a note to the drawing from which the above details are taken, says:—"This Orchid is common in many places, in some it forms a bed in which several thousand plants are to be found in a few square yards." It is called "Tenondahy" by the natives.

CYMBIDIUM.

The only species of the genus recorded from Madagascar is a very doubtful plant figured by Thouars, Orchid. Iles Afriq. tt. 39, 40, under the name of *Limodorum flabellatum*, which was afterwards referred to the genus *Cymbidium* by Lindley in his 'Genera and Species of Orchidaceous Plants,' p. 167, under the name of *C. flabellatum*. His description is obviously taken from Thouars's plate. I have seen no plant answering to the figure, and have great doubts as to its belonging to the genus *Cymbidium* as now understood. In habit it rather resembles a *Eulophia*. The genus is distributed over the tropical and subtropical regions of the Old World, being most abundant in the Indo-Malayan region. Two species, however, occur in Africa, both in the south.

GRAMMANGIS.

The species on which this genus is based is *G. Ellisii*, Reichb. f. (*Grammatophyllum Ellisii*, Lol.), a plant only known from Madagascar, to which Benth. and Hook. f., 'Genera Plantarum,' p. 537, would add *Cymbidium Huttonii*, Lindl., a species formerly in cultivation which has been stated to have come from Java. The genus is allied to *Ansellia* and *Cymbidium*, from which latter it differs in the petals being much smaller than the sepals.

G. ELLISII, *Reichb. f. Xenia Orchid.* ii. 17.—Grammatophyllum Ellisii, *Lindley, Bot. Mag.* t. 5179; *Williams, Orchid Album*, vol. iv. t. 47; *Bateman, Second Century of Orchidaceous Plants*, t. 176; *Flore des Serres*, xiv. t. 1488.

Was introduced to this country by the Rev. W. Ellis and first flowered on Aug. 23, 1859, from plants obtained some years before. Since this time it has frequently flowered in this country; but I have not seen a wild specimen in either of the herbaria of the British Museum or Kew.

POLYSTACHYA.

This genus is widely distributed throughout the tropics of both worlds, and is well represented in Madagascar. Most of the species here mentioned are endemic, only one occurring also in the other islands. Besides these there are figures of one or two among Deans Cowan's drawings which are probably undescribed, but without sufficient material for description.

P. CULTRATA, *Lindley, Bot. Reg.* sub t. 851; *Gen. and Spec. Orch. Pl.* p. 73; *Reichenbach fil, in Bonplandia*, 1856, p. 324; *S. Moore in Flora Maur. & Seych.* p. 361.—Dendrobium cultriforme, *Thouars, Orch. Iles Afr.* t. 87; *A. Rich. Orch. Maur.* t. 8. f. 3.

Madagascar: Imerina, Ikangosoa, Ankafana, *Deans Cowan*! Ankaratra montes, apud truncos sylvæ primævæ, Jan. 1881, *Hildebrandt* no. 2863! *in Herb. Brit. Mus.*; *Parker in Herb. Kew*! Mauritius, *Capt. Carmichael*! *Herb. Brit. Mus.*, *Bouton*! *Ayres*! *in Herb. Kew.* Bourbon, *Balfour*! *in Herb. Kew.*

The broad solitary leaf, 5 inches in length by 1 in diameter, and larger white flowers in a glabrous panicle, distinguish this plant from the rest of the Madagascar species. The scape is from 6–8 inches long, and has a solitary long sheathing-leaf 1–1½ inch in length at the base.

The variety *nana*, S. Moore, a smaller plant with usually a racemose inflorescence, occurs also in Madagascar.

P. ANCEPS, n. sp.; caulibus approximatis, basi turgidis vix pseudobulbosis, basibus foliorum vetustorum tectis; foliis sæpius duobus, lanceolatis obtusis bilobis; scapo erecto glabro, vagina longissima ancipiti sæpius ad basin paniculæ tecto; bracteis parvis triangularibus; floribus parvis, quam *P. zeylanicæ* majoribus; pedicellis longiusculis; sepalo postico lanceolato acuto, sepalis lateralibus lanceolato-triangularibus acutis; petalis linearibus lanceolatis acutis, sepalo postico subæquantibus; labello

trilobo, lobis lateralibus brevibus obtusis, medio oblongo obtuso; unguiculo labelli longiusculo, in basi callo oblongo papilloso.

Ankafana, *Hildebrandt*! no. 4222; Imerina, Ankafana, *Deans Cowan*! *in Herb. Brit. Mus.*; *Baron* 192! *Herb. Kew.*

The flowers of this plant much resemble those of *P. fusiformis*, Lindley, *Dendrobium fusiforme*, Thouars, two flowers of which, from Thouars's collection, I have seen in the Herbarium of the British Museum, but the habit of the plant is quite different. There are two sheathing-leaves on the scape, of which the lower one almost invariably reaches to the base of the panicle and is about 3½ to 4 inches long, striate, and winged on both sides for its whole length; the other is very much shorter, being partially overlapped by the lower one. The whole plant dries black.

There is a figure of what appears to be this plant in Deans Cowan's drawings, the sepals and petals and base of the lip of which are cinnamon, the apex of the lip rose-colour.

POLYSTACHYA ROSEA, n. sp.; foliis 2–3 angustis oblongis lanceolatis, apice bilobis, patentibus vel reflexis; scapo erecto vaginis ad 3 dissitis breviusculis munito simplici, rarius ramoso; floribus paucis roseis; bracteis minutis ovatis; sepalo postico angusto lanceolato acuto; petalis linearibus brevioribus; sepalis lateralibus lanceolatis triangularibus curvis acutis; labello trilobo, lobis lateralibus brevibus obtusis, medio brevi oblongo integro; capsula oblonga ¾-unciali.

Imerina, *Deans Cowan*! *in Herb. Brit. Mus.*

This plant resembles *P. luteola* in its general habit, but is distinguished by its simpler inflorescence, rarely branched, more numerous and shorter leaf-sheaths on the stem, broader dorsal sepal, and colour.

The whole plant is half a foot high; the leaves 4 inches long, half an inch in diameter. The bracts are 1 line long, the pedicel 9 lines. The whole of the flower is rose-pink, with a darker spot in the centre of the lip.

P. VIRESCENS, n. sp.—Semipedalis, caule basi tumido; foliis ovatis obtusis 2, inferiore minore; racemo laxo basi paullo ramoso, floribus pluribus parvis virescentibus, bracteis ovatis brevibus; sepalo postico lanceolato, lateralibus oblique triangulari-ovatis; petalis angustis linearibus rectis; labello trilobo, lobis lateralibus brevibus ovatis obtusis, lobo medio oblongo obtuso.

Ankafana, on trees, *Deans Cowan.*

The whole plant is 6 inches high, the longest leaves 2 inches in length by ¾ in breadth. I only know this from two coloured drawings with details and notes. It must be closely allied to *P. luteola*, Hook., a S. American plant.

Other Madagascar species are:—

POLYSTACHYA ROSELLATA, *Ridley in Journ. Linn. Soc.* xx. 330.—Ankafana, *Deans Cowan in Herb. Brit. Mus.*; and P. MULTIFLORA, *Ridley, l. c.*, from the same locality, collected both by Deans Cowan and Hildebrandt (March 1881, no. 4220, in Herb. Brit. Mus.).

P. JUSSIEUIANA, *Reichenbach fil. in Walpers's Annales*, vi. p. 640, I cannot recognize, as the description is too imperfect for such a difficult genus.

ACAMPE.

This genus consists of about a dozen species, of which the bulk are natives of tropical Asia and China, one or two occurring in Southern Africa. The only Madagascar species yet known is *A. Renschiana*, Reichenbach fil, Otia Hamburg, fasc. 2, p. 77, which was discovered by Hildebrandt in Nossibé; no. 3392 of his collection.

ANGRÆCUM.

A large genus of about 60 known species, of which all but one are natives of Africa and its adjoining islands, the remaining one being found in China and Japan. The species differ very greatly in the form and size of the flower, and in the caudicle and gland of the pollinium, and have been divided into genera according to the number of the latter, with no very satisfactory result, since the pollinia are frequently missing in herbarium specimens, and moreover sometimes plants apparently closely allied differ entirely in the structure of the pollinia.

§ *Macrura.*

A. SESQUIPEDALE, *Thouars, Orch. Iles Afriq.* tt. 66, 67; folio, pl. i., ii.; *Hooker, in Bot. Mag.* t. 5113; *Lindley, Gard. Chron.* 1857, p. 252; *Flore des Serres*, t. 1413; *Illustr. Horticole*, vol. viii. p. 77, t. 475; *Gartenflora*, t. 744.—Aeranthus sesquipedalis, *Lindley, Gen. and Sp. Orch. Pl.* p. 214 (nomen nudum).

Madagascar: Ankafana, apud saxa, *Hildebrandt* no. 3983! same locality, very common, *Deans Cowan*! *in Herb. Brit. Mus.*;

between Tamatave and Antananarivo, *Meller* no. 1617!; Central Madagascar, *Baron*! *in Herb. Kew.* It is also reported from Zanzibar, but I have not seen specimens.

This plant was first flowered by the Rev. W. Ellis, at Hoddesdon, in the year 1857; specimens from whom, with a drawing of the plant made by Mrs. Ellis, are in the Lindleyan Herbarium.

The whole plant is not more than two feet high, being smaller than *A. eburneum,* simple or with one or two branches. The leaves are numerous, broad, oblong, thick and fleshy, dark green, and keeled at the base, very unequally lobed, and more imbricate than those of *eburneum.* Several stout peduncles are produced from the axils, each bearing from 2 to 4 of the large white or greenish-white waxy flowers. The sepals and petals are lanceolate acuminate, almost triangular, the former spreading, the latter reflexed. The lip is similar in size and shape, 3 inches in length. The spur, in spite of the specific name, appears never to attain a greater length than one foot. The bract at the base of the ovary is short and blunt, fitting closely to the pedicel, but its edges do not quite meet. The column is white, very short and broad, the clinandrum small, the rostellar lobes large and foliaceous, horizontal, and stiff, the right-hand one overlapping the other; they are blunt and raised in the middle, white edged with yellow; beneath them is a deep chamber, at the back of which is the stigma. The pollinia are bluntly wedge-shaped, and the caudicles are shorter than the narrow flat viscid disks. The ribs of the ovary are produced into somewhat sinuous and appressed wings.

ANGRÆCUM GLADIIFOLIUM, *Thouars, Orch. Iles Afriq.* t. 53; *Lindley, Gen. and Spec. Orch. Pl.* p. 246; *Bot. Reg.* 1840, t. 68; *Rich. Orch. Maur.* p. 69.—Orchis mauritiana, *Lamarck, Encycl.* vi. p. 601.—Aeranthus gladiifolius, *Reichenbach fil. in Walp. Ann.* vi. p. 900; *S. Moore in Flor. Maur. & Seych.* p. 350.

Madagascar, *Thouars*; Imerina! Tanala! *Deans Cowan in Herb. Brit. Mus.* Mauritius, *Capt. Carmichael*! *Sieber Fl. Maur.* ii. no. 171! *in Herb. Brit. Mus.*; *Bouton*! *Ayres*! *Herb. Kew.* Bourbon, *Boivin*! *Balfour*! *Herb. Kew.* Ins. Mascarenes, specimens without specific locality, collected by Thouars and Sir J. Macgregor, are in Herb. Brit. Mus.

This plant is easily recognized by its flattened, slightly flexuous stem, covered with wrinkled shortly-winged leaf-sheaths. It is about a foot or rather more high, with narrow, acute, spreading, light-green leaves, 2½ inches in length by ½ an inch across. The flowers are solitary, on short peduncles, white or yellowish white. The ovary and pedicel are white, 1½ inch in length, twice as long as the peduncle. The petals and sepals are about ¾ inch long, the petals narrower than the sepals, and spreading, the lateral sepals deflexed. The lip is broader, with a slender spur 3 inches long, white, becoming yellowish towards the apex. The column is rather short. The caudicles somewhat long. The affinity of the plant is with *A. recurvum.*

ANGRÆCUM RECURVUM, *Thouars, Orch. Iles Afr.* t. 56; *Rich. Orch. Maur.* p. 70.—A. fragrans, var., *Lindley, Gen. and Spec. Orch. Pl.* p. 246.—Aeranthus rectus, var.? recurvus, *S. Moore, in Flor. Maur. and Seychelles,* p. 351.

A. caule crasso erecto; foliis distichis imbricatis, apice bilobis, 5-uncialibus; pedunculis pluribus in axillis foliorum erectis vel patentibus unifloris; vaginis ampliatis membranaceis obtusis; floribus majoribus, albis inexpansis; sepalis lanceolatis acutis; petalis subsimilibus porrectis, basibus omnium margine crispis et ad columnam et basin labelli adnatis; labello spathulato acuto, basi decurvo, lobis lateralibus erectis brevibus approximatis, medio spathulato acuto porrecto; calcare longo filiformi tereti, quadrante basali recto pendulo, reliquo abrupte curvo; columna brevi; lobis rostelli latis foliaceis obtusis erectis; anthera depresso-conica; polliniis bilobis glandulis oblongis ovatis; caudiculis minimis.

Madagascar, Ankafana, *Deans Cowan*! *in Herb. Brit. Mus.* Mauritius, *Bojer.* Also Bourbon.

This plant has been reduced to a variety of *A. rectum*, Thouars, by S. Moore, *l. c.*, which it probably is. I have seen no specimen resembling Thouars's figure of the latter plant; but there is among Deans Cowan's drawings, besides a very good figure of *A. recurvum*, Thouars, a coloured drawing somewhat resembling Thouars's figure of *A. rectum.* It differs from the other species in the much closer leaves, blunter sepals and petals, the lateral sepals being recurved and not thrown forward, the more angular lip, and more irregularly and slightly bent green spur. Of it Deans Cowan says:—"Very powerful perfume at night, erect on branches, Ankafana."

A. recurvum, Thouars, has an erect stem, covered with rather close strap-shaped leaves, 5 inches in length by ½ an inch across, dark green, with the apices recurved. From the axils spring about six slender peduncles on each plant, about 2 inches long, bearing a few loose brown sheaths. The ovary and pedicel are about 2½ inches in length, erect or a little spreading. The posticous sepal is erect. The laterals, together with the petals, are thrown forwards at right angles to the erect column. At the base they are adnate to the column, and the lateral lobes of the lip and their edges at this spot are crisped and wrinkled. The base of the lip is thickened and curved downwards, and the side lobes are erect, so as to form a guiding passage to the entrance of the spur. The middle lobe of the lip is spathulate in shape and acute; it is bent up, making an angle with the base so as to be parallel to the petals. The whole lip is somewhat shorter than the sepals, which are three quarters of an inch in length. The spur is 4 inches long, the first inch of which is almost parallel with the ovary; it is then bent up abruptly, almost at right angles, taking a sigmoid curve. The column is short, but proportionally longer than in *A. sesquipedale*. The lobes of the rostellum are rather large, and overhang the entrance to the spur. The pollinia are oblong, grooved on the back so as to be almost bilobed, the hind lobe being the smaller one. The caudicles are very short, the glands separate, ovate, acute, and flat.

ANGRÆCUM SPATHULATUM, n. sp.; caule crassiusculo pedali, vaginis vetustis membranaceis striatis transversim rugosis tecto; foliis ligulatis obtusis crassiusculis uncialibus, inæqualiter bilobis; floribus mediocribus singulis in pedunculis brevibus vaginis 3–4 tectis; sepalo postico erecto lanceolato, lateralibus obliquis lanceolatis acutis; petalis spathulato-lanceolatis; labello ovato spathulato obtuso; calcare filiformi pendulo, ovarium paullo superante; columna brevi, rostelli lobis aliformibus erectis planis; caudiculis brevibus; glandulis parvis distinctis; ovario recto.

Ankafana, no. 3988, *Hildebrandt* ! *in Herb. Brit. Mus.*

The affinity of this plant is with *A. recurvum*, Thouars. It has a stout stiff stem, about 1 foot in height, covered with the bases of the old leaves, and terminated by a few short, blunt, unequally bilobed leaves, 1 inch long by ¼ in breadth. The flowers occur singly, each supported on a slender peduncle, covered with 3 or 4 sheathing-leaves. They are rather bigger than those of

A. gladiifolium. The dorsal sepal is erect; the others, with the petal, are thrown forwards as in *A. recurvum.* The petals are narrowed at the base, then dilated, and acute at the apex. The lateral sepals are obliquely lanceolate. The spur is an inch long, and hangs straight down, a little longer than the ovary. The rostellar lobes are foliaceous and stiff, as in *A. recurvum,* but instead of sloping upwards so as to form an arch as in that plant, they are quite vertical and the edges do not meet. The pollinia are grooved on the back; the glands like those of *A. recurvum.*

ANGRÆCUM MAXILLARIOIDES, n. sp.; caule brevi; foliis ligulatis obtusis inæqualiter bilobis 9-uncialibus vel ultra; flore singulo magno albo in pedunculo semipedali ex axilla folii inferioris oriente; sepalis carnosis lanceolatis acutis; petalis similibus angustioribus, deorso carinatis; labello late lanceolato acuto carnoso, sepalis subæquali; calcare filiformi pendulo, basi abrupte dilatato biunciali; columna brevi crassa; lobis rostelli cornutis erectis; ovario longo, 6-costato.

Ankafana in arboribus, *Deans Cowan*! *in Herb. Brit. Mus.*; Central Madagascar, *G. W. Parker*! *in Herb. Kew.*

This plant has much the habit of *Angræcum triquetrum,* Thouars, but is much larger in all its parts. The leaves are strap-shaped and stiff, 9 inches in length and 1 across in Deans Cowan's specimen; but he says, in a note to a drawing of it:—"Of this there seems to be another variety, with leaves about twice as large as this one." From the axil of one of the lower ones rises a peduncle bearing a solitary large white waxy flower, recalling very much the habit of one of the large Maxillarias. The base of the peduncle is covered with a few short sheathing-leaves. The sepals are lanceolate and acute, 7-veined, 1½ inch long by 5 lines across at the base; the petals are narrower, 6-veined, with a median ridge on the dorsal surface. The lip is in the normal position raised above the lower sepals and petals; it is broadly lanceolate-acute. The sides at the base are erect, leaving a narrow channel down the middle, and at a point about one third of its length from the base the edges are so closely approximated as almost to meet, after which they diverge again. There is a low ridge running in the median line for a short way from the base of the lip. The spur is cylindrical and pendent, 2 inches long; where it joins the lip it is somewhat abruptly dilated into a small bulb. The column is short and thick, the lobes of the rostellum erect and horn-shaped. The ovary is long, almost cylindrical, and slightly curved, with six low ribs running its whole course. The anther and pollinia I have not seen. The whole plant dries black. The old leaf-sheaths of the lower leaves break up into fibres which cover the stem.

§ *Euangræca.*

ANGRÆCUM EBURNEUM, *Thouars, Orch. Iles Afriq.* t. 65; *Rich. Orch. Maur.* t. 71; *Lindley, Gen. and Spec. Orch. Pl.* p. 245; *Reichenbach fil. in Walp. Ann.* v. p. 904; *S. Moore, in Flor. Maur. and Seych.* p. 356; *Bot. Mag.* t. 5170; *Lindley, Paxt. Fl. Gard.* vol. i. pp. 25, 26 (xylogr.).—Limodorum eburneum, *Bory, Voy.* i. p. 359, t. 19; *Willd. Sp. Pl.* iv. p. 125.—A. virens, *Lindley, Bot. Reg.* 1847, sub t. 19; *Paxt. Fl. Gard.* vol. i. p. 25, figs. 9, 10.

Madagascar, *Forbes* (*fide Lindley*); also in Ambongo Island, *Pervillé* no. 148 *in Herb. Lindley.* Seychelles, *Perceval Wright in Herb. Kew.* Bourbon, *Thouars.* Comoro Islands, Johanna, *Kirk.*

This plant and the two following are very closely allied, and indeed *A. eburneum* and *superbum* were reduced by Lindley, in Paxton's Mag., to one species. The flowers, however, of *eburneum* are somewhat smaller, and the cordate lip is so constant that it seems better at present to keep them distinct. In *A. superbum* the lip is pure white, and the carina shorter and broader, the petals and sepals duller green, and the whole flower more fleshy.

The variety *virens* (*A. virens*, Lindley) only differs from typical *eburneum* by being somewhat greenish in the middle of the lip.

A. SUPERBUM, *Thouars, Orch. Iles Afriq.* tt. 62, 63, 64; *Lindley, Gen. and Sp. Orch. Pl.* p. 245.—A. eburneum, *Lindley, Paxt. Mag.* 1849, xvi. p. 90; *Bot. Reg.* xviii. pl. 1522; *Hook. Bot. Mag.* t. 4761 (*non Thouars*).

Madagascar only, *Thouars*! *in Herb. Brit. Mus.*; inter Tamatave and Antananarivo, *Meller in Herb. Kew.*

This species is distinguished from *A. eburneum* by its broader and more rhombiform lip, with a shorter and somewhat broader cusp, thicker and blunter spur, and shorter, broader, and blunter sepals and petals.

A. BRONGNIARTIANUM, *Reichenbach fil. Pescatorea,* i. p. 16; *Walp. Ann.* vi. p. 904.

Nossibé, Ankiabé, May 1879, *Hildebrandt* no. 2990. Also

Comoro Isles, Johanna, *Hildebrandt* no. 1704!; and Mahé, Seychelles, *Boivin*! *in Herb. Brit. Mus.*

This is the largest plant of the section; the leaves are more than 2 feet long and 3 inches across, the raceme is more than 2 feet in height, and bears a number of flowers as large as those of *A. superbum*, from which plant it is distinguished by its wider leaves and smaller bracts, lanceolate and acuminate and acute petals and sepals, and much longer and more slender, slightly curved spur. The petals and sepals are green, 2 inches in length by 2 lines across. The lip is white, and has a rhomb-shaped ridge running down the centre as in *superbum*, but rather more prolonged, ending in a raised line. The capsule is elongate, subcylindrical, 1½ inch in length and ¼ inch in diameter in the only specimen which I have seen, which is, however, not quite ripe. The bracts are ovate, short, rather blunt, ¾ inch in height. The column is green.

The following six species, together with *A. caudatum*, form a well-marked group, characterized by the long terete, not foliaceous rostellum, the larger semiterete column, and the usually ovate cuneate leaves.

ANGRÆCUM CITRATUM, *Thouars, Orch. Iles Afriq.* t. 61; *Hooker, in Bot. Mag.* t. 5624.

This plant appears to be common in Madagascar, whence it was introduced into cultivation by Messrs. Veitch.

It has been collected at Ankafana "very common" (Deans Cowan, and Hildebrandt no. 3987); Imarina (Deans Cowan, and Baron no. 201); between Tamatave and Antananarivo (Meller in Herb. Kew); and there are specimens collected by Du Petit Thouars and Thompson in Herb. Brit. Mus., and by Langley Kitching, and Parker in Herb. Kew, without specific localities. It does not appear to have been met with in any of the other islands. The stem is short, and the leaves vary from lanceolate to obcuneate, entire at the tip, 3½ inches long by 1½ across in dried specimens. There is usually, in the wild plant at least, only one raceme to the plant; but in a specimen collected by Thompson in the British-Museum Herbarium there are no less than 5, one of which attains a length of 11 inches; they bear about 18 flowers, sometimes much less, and sometimes as many as 27, rather crowded together. The flowers are about 1 inch across, white or greenish white; I have never seen them yellow as figured by

Thouars. The dorsal sepal is much smaller than the laterals; it is erect, ovate, and blunt, ¼ of an inch long; the petals are wider than the sepals, ½ an inch long, 5-veined. The lip is almost obcuneate, ½ an inch long and the same across in the broadest part, 7-veined. The spur is 1 inch long, cylindrical, and hanging vertically downwards for the greater part of its length, and then abruptly bent at an obtuse angle, at which point it is much dilated. The column, as in its allies, is rather longer than usual (1 line), glabrous, semiterete, and slightly curved; the stigma is oval; the anther is ovate acute. The pollinia are fixed to a single gland with an obcuneate flat caudicle. The rostellum resembles that of *A. modestum*, to which this plant is allied. The capsule is about 1 inch long and 2 lines thick, obscurely 3-angled, with low ribs.

ANGRÆCUM MODESTUM, *Hooker fil. in Bot. Mag.* t. 6673.

Madagascar, Ankafana, *Deans Cowan* ! *in Herb. Brit. Mus.* Introduced into cultivation by the Dowager Lady Ashburton, a specimen from whom is in the Kew Herbarium.

A stout plant with cuneate-lanceolate leaves, 5 inches in length and 1 in diameter. The raceme is about a foot in length, the rhachis and bracts brown, and bears from 6 to 9 white flowers about as big as those of *A. gladiifolium*. The sepals are lanceolate, ½ an inch long and 2½ lines across; the petals a little broader and shorter. The lip is similar in shape to the petals, but broader and more acute and fleshy, ½ an inch long and ¼ across; it clasps the column at the base, and below the latter is a slight depression leading to the spur, over which hangs the rostellum and caudicle of the pollinia. The spur is 4 inches in length, filiform, broadest at the base, gradually tapering to a point. The column is straight, yellow, rather thick and sparingly hispid; it is about 2 lines long. The anther is conical, with rather a long apiculus; inside it has two small flaps or pockets which make it nearly bilocular. The pollinia are rather large, ½ a line in length, oblong, with a small groove in the back. They are attached to a long (1½ mm.) caudicle, which lies in a groove of the rostellum, and bears a broad oblong gland (1 mm. long), which shows some signs of its double origin in having a notch at the point. The rostellum is subterete and horn-shaped, curved up at the end, and overhanging the stigma and mouth of the spur. There is a groove along the upper surface, in which lies the caudicle, and the end is clasped by the gland, which projects a little beyond it. The stigma is semioval and rather deeply sunk.

The affinity of this plant is with *A. apiculatum*, Lindl., a native of Sierra Leone.

Angræcum fuscatum, *Reichenbach fil. in Gard. Chron.* Oct. 14, 1882, p. 488; A. articulatum, *Reichb. f. in Gard. Chron.* 1872, p. 73; A. hyaloides, *Reichb. f. in Gard. Chron.* 1880, i. p. 264; *and* A. fastuosum, *Reichb. f. l. c.* 1884, ii. pp. 748, 844, belong to this section.

All were introduced into cultivation from Madagascar, and appear to be extinct again in England. I have seen no specimen, wild or cultivated, in the herbaria of the British Museum or Kew.

A. ELLISII, *Reichenbach fil. Flora*, 1872, p. 278; *Gard. Chron.* 1875, p. 277 (xylogr.); *Floral Magazine* n. s. t. 191.

Madagascar, Ankafana, *Deans Cowan in Herb. Brit. Mus.*!

This fine plant was introduced into cultivation by Rev. W. Ellis, whose name it bears.

It is characterized by its completely reflexed petals and sepals, which give it the appearance of a hovering bird. It has large dark-green leaves, 10 inches in length by 2 across, broadly ligulate and unequally bilobed. The flower-spikes in cultivation attain a length of 2 feet; they are somewhat nodding, and bear from 18 to 24 flowers, very fragrant, from pure white to yellowish white; the long gracefully curved spur, 6 inches or less in length, and the ovary being of an ochreous-cinnamon colour.

A. cryptodon, *Reichenbach fil. Gard. Chron.* 1883, ii. p. 307, was introduced into cultivation by Low. Its affinity is with *A. Chailluanum*, Lindley.

A. FILICORNU, *Thouars, Orch. Iles Afriq.* t. 32; *Lindley, Gen. and Sp. Orch. Pl.* p. 246.—Aeranthus ? Thouarsii, *S. Moore, in Flor. Maur. & Seych.* p. 351.

Madagascar, *Thouars*; Antananarivo, *Rutenberg, fide Kranzlin* ? Tanala, Imarina, *Deans Cowan.*

I only know this species from Thouars's figure, unless the plant collected by Deans Cowan above mentioned belongs to it. This closely resembles *A. filicornu* in most respects, but the lip, instead of being pandurate and rather acute, is oblong-elliptical and blunt, and the spur is only 2 inches long. The stem is flexuous, about 6 inches high; the leaves linear, spreading, blunt, and bilobed at the apex, with rather long, transversely wrinkled sheaths. The flower is open, the dorsal sepal erect, the laterals spreading, elliptical, lanceolate, and curved. The lip is ½ an inch long by ⅓. The spur is very slender and straight; the ovary 1 inch long; the pedicel very slender, with a short ovate bract.

ANGRÆCUM TERETIFOLIUM, n. sp.; caule erecto flexuoso gracili rigido; foliis teretibus, demum recurvis, rigidis acutis dissitis; pedunculo gracili tereti erecto unifloro; bractea ovata; floribus mediocribus expansis; sepalis anguste linearibus acuminatis semiuncialibus; petalis angustissimis linearibus acuminatis subæqualibus; labello lanceolato triangulari acuminato acuto; calcare longissimo filiformi; capsula oblonga semiunciali costis prominulis.

Ankafana, *Deans Cowan! in Herb. Brit. Mus.*

This plant has erect flexuous stems from 6 to 14 inches in height, with internodes ½ an inch in length. The leaves are terete, pungent, at first erect, afterwards recurved, 2½ inches in length, subdistichous, with rugose sheaths. The flower of moderate size, with very narrow petals and sepals, ½ an inch in length by 1 line in the broadest part. The lip is nearly an inch long, ¼ across in the broadest part, ovate, lanceolate, triangular, acute. The spur is very long and slender; the only one I have seen was 4 inches long and imperfect. The affinity is with *A. filicornu*, Thouars.

A. IMPLICATUM, *Thouars, Orch. Iles Afr.* t. 58; *Lindley, Gen. & Sp. Orch. Pl.* p. 246; Aerobion implicatum, *Sprengel*;—and A. RUTENBERGIANUM, *Kranzlin, Verh. Bremen*, vii. p. 257, are species not known to me. The latter was collected by Rutenberg in the Ankaratra Mountains. It is stated to resemble *A. cucullatum*, Thouars, except in the lip, which is described as "rhombeum."

A. COWANII, n. sp.; caule semipedali curvo crassiusculo; foliis paucis dissitis linearibus obtusis oblique bilobis, striatis patulis; pedunculo gracili 1½-unciali erecto, ex axilla folii inferioris, unifloro; flore mediocri inexpanso tenui; bractea obtusa; sepalis petalisque subsimilibus ovatis lanceolatis obtusis; labello ovato obtuso, sepalis subæquali; calcare filiformi obtuso pendulo semiunciali; lobis rostelli foliaceis verticalibus; anthera brevissime apiculata; polliniis sulcatis; caudicula brevissima, glandula singula; ovario parum curvo.

Imerina, *Deans Cowan*! *in Herb. Brit. Mus.*

This plant has a stem 6 inches long, covered with the old leaf-sheaths, and bearing 4 or 5 narrow, linear, blunt leaves at the top. The leaves are 3–3½ inches long, ¼ inch across. The petals, sepals, and lip are all very similar in shape, the lip being the broadest; they are ovate-lanceolate and hardly expanded.

ANGRÆCUM CLAVIGERUM, n. sp.; caule brevi radicante; foliis lanceolatis obtusis, inæqualiter bilobis, carnosis uncialibus; floribus singulis albis mediocribus, in pedunculis gracilibus suberectis uncialibus e medio internodii orientibus, vaginis tribus ovatis parvis; sepalis lanceolatis acuminatis acutis; petalis subsimilibus brevioribus latioribus; labello petalis subæquali, ovato-lanceolato plano, carina media; calcare brevi, ovario subæquali, pendulo clavato, apice curvo; columna brevi crassa; lobis rostelli foliaceis erectis obtusis; anthera depressa operculari; polliniis parvis, caudicula brevi, glandula angusta lineari quam caudicula longiore; ovario brevi curvo, ¼-unciali.

Imerina, Ankafana, *Deans Cowan*!; Ankafana, *Hildebrandt*, Mar. 1, 1881, no. 3978! *in Herb. Brit. Mus.*

A small plant with much of the habit of *A. pectinatum*, creeping on the bark of trees and emitting copious and long roots. The leaves are thick and fleshy, oblong lanceolate, blunt and unequally bilobed, 1 inch long by ¼ in diameter. The flowers are solitary on slender peduncles, springing from the lower part of an internode and not from the axil of a leaf. They are about the size of those of *A. cucullatum*, Thouars, white with a green centre. The petals and sepals are rather thin in texture and hardly spreading; the petals are 6, the sepals 8 lines in length. The lip is similar in shape and about as long as the petals, but a little broader; the median line is pinched up so as to form a central ridge. The spur is about ¼ of an inch long, hanging vertically down; it is club-shaped, with the end turned up. The stigma is rather broad; the anther flat and rather small. The pollinia are supported on a straight short pedicel and a longer narrow gland.

A. ROSTRATUM, n. sp.; rhizomate longo lignoso gracili; radicibus multis gracilibus; foliis copiosis alternis lanceolatis obtusis carnosis, vaginis (siccis) transversim rugosis; floribus singulis in axillis foliorum superiorum, viridibus mediocribus, pedicello ½-unciali gracillimo; sepalis late linearibus obtusis carnosis; petalis linearibus lanceolatis, basi dilatatis, obtusis

carnosis, versus apicem teretiusculis; labello recto, lobis lateralibus parvis ovatis erectis, ad columnam appressis, lobo medio rostriformi carnoso tereti acuminato; calcare longo horizontali, basi decurvo dilatato, apice clavato; columna brevissima lata; anthera obtuse subovata obscure biloculata; ovario pedicellæ subæquali.

Ankafana, in sylvis, Martio 1881, *Hildebrandt* no. 3976!; ibidem, *Deans Cowan* (icon.).

This plant is allied to *A. gladiifolium*, Thou. The rhizome is about a foot long, rather slender, with numerous thick, fleshy, blunt leaves from ¾ to nearly 1 inch in length. The pale green flowers, rather smaller than those of *A. gladiifolium*, Thou., are solitary in the axils of the upper leaves on very slender pedicels ½ an inch in length. The petals and lateral sepals, which are narrow and fleshy, are apparently not patent, but carried forward horizontally. The lip is ½ an inch in length; it has two small erect lateral lobes, the median one being long and beak-like, quite cylindrical for the greater part of its length, and tapering to a point. Between the lateral lobes is a depression, which gradually fades away in the median lobe. The spur is long and horizontal, a little dilated where it joins the lip; and the end is clavate and slightly upcurved. The ovary is about ½ an inch in length.

Aeranthus Curnowianus, *Reichenb. fil. Gard. Chron.* 1883, ii. p. 306, a plant recently introduced into cultivation from Madagascar, would belong to the genus *Angræcum* as defined by the authors of the 'Genera Plantarum.' I have not seen it.

ANGRÆCUM CRASSUM, *Thouars, Orch. Iles Afriq.* tt. 70, 71; *Lindley, Gen. and Sp. Orch. Pl.* p. 245.—Aerobion crassum, *Sprengel, Syst. Veget.* iii. p. 716.

A. caule crasso erecto tereti 15-unciali; foliis ligulatis loratis obtusis, inæqualiter bilobis patentibus subpedalibus; racemo horizontali, bracteis brevissimis crassis; floribus erectis secundis inapertis magnis, albescente-viridibus; petalis sepalisque lanceolatis, his brevioribus; labello cucullato ovato, basi saccato; calcare crasso brevi cylindrico obtuso pendulo, quam ovarium triente breviore; columna curva brevi; ovario crasso ovali-oblongo, ferme sessili; costis prominulis.

Madagascar, *Thouars*; prope Beforon inter Tamatave et Antananarivo, *Meller*! *in Herb. Kew.*

"Flowers alternately white and yellow."

§ *Pectinaria.*

ANGRÆCUM PECTINATUM, *Thouars, Orch. Afriq.* t. 51; *Lindley, Gen. and Sp. Orch. Pl.* p. 247; *Rich. Orch. Maur.* p. 68, t. 10. f. 5; *Hook. Journ. Bot.* i. 47, t. 116.—Aeranthus pectinatus, *Reichb. f. in Walp. Ann.* vi. p. 900; *S. Moore, in Flor. Maur. et Seych.* p. 350.

A. rhizomate sæpe longe repente; caulibus erectis vel curvis, rigidis sæpius ramosis; foliis distichis coriaceis linearibus loratis obtusis, parum recurvis, ½-uncialibus; floribus singulis in axillis foliorum superiorum, inexpansis parvis albis, ferme sessilibus; bracteis paucis ovatis obtusis; sepalis et petalis oblongis obtusis; labello lanceolato acuto; calcare quam ovarium breviore rectiusculo obtuso subclavato; columna brevi; lobis rostelli brevibus subacutis; anthera depressa; glandulis brevibus oblongis; caudiculis nullis; capsula ovali fusiformi ½-unciali, costis alatis.

Madagascar, *Thompson*! *in Herb. Brit. Mus.* Mauritius, *Chapelier*! *Capt. Carmichael*! *Dr. Wallich*! *in Herb. Brit. Mus.*; Pouce, *Ayres*! *Bouton*! *Telfair*! *in Herb. Kew.* Also Bourbon.

The main stem of this plant creeps on the tree-trunk in old specimens for as much as 4 inches, sending up stiff lateral branches, erect or more rarely nodding, closely covered with the transversely rugose leaf-sheaths, and from 5 to 6 inches in height. The leaves are about ½ an inch long, rather thick, linear, oblong, obtuse. The flowers are very shortly pedicellate, and occur singly in the axils of the upper leaves; they are white, and do not appear ever to expand. The petals and sepals are short, lanceolate, oblong, the lip acute. The spur is ⅓ of an inch long, straight, obtuse, slightly dilate at the apex. The pollinia sessile on two short oblong glands. The capsule is subcylindrical, ½ an inch long.

MYSTACIDIUM, *Lindley.*

The typical species of this genus are short-stemmed plants with secund racemes of rather or very small flowers, with usually long spurs, to which have been added a number of plants of very different habit, including the genus *Gussonia*, Richard (*Microcœlia*, Lindley), which seems to be sufficiently distinct. *Pectinaria*, a section proposed by the authors of the 'Genera Plantarum' for *Angræcum distichum*, Lindley, and *A. pectinatum*, Thouars, seems better referred to *Angræcum*; while to the section *Gomphocentrum*, distinguished by its racemes of many flowers and club-shaped or

saccate spur, must be added *M. ochraceum*, n. sp., with solitary flowers and a filiform spur.

§ *Gomphocentrum.*

MYSTACIDIUM CAULESCENS, *mihi.*—Angræcum caulescens, *Thouars, Orch. Iles Afr.* t. 75; *Rich. Orch. Maur.* p. 73, t. 10. fig. 3; *Lindley, Gen. and Sp. Orch. Pl.* p. 247; *Hook. Lond. Journ. Bot.* 1834, p. 48, t. 117; *S. Moore, in Flor. Maur. & Seych.* p. 357.

M. caule sæpius brevi; foliis pluribus lanceolatis acutis striatis carinatis; racemo flexuoso erecto paucifloro, vaginis paucis ovatis; floribus parvis albis brevi-pedicellatis expansis; sepalis lanceolatis acutis, petalis similibus angustioribus; labello ovato cordato acutiusculo plano; calcare brevi crassiusculo clavato recto, apice curvo; columna brevi crassiuscula curva; lobis rostelli verticalibus obtusis; anthera depressa; ovario erecto parum curvo.

Ankafana, *Deans Cowan* ! *in Herb. Brit. Mus.* Also Bourbon, *Balfour.* Mauritius, *Telfair* ! *Ayres, Bouton, etc.*

A small tufted plant, with a usually short stem and a moderate number of leaves, generally lanceolate, 2–3½ inches long, by ⅓–½ across, sometimes shorter and broader, 1½ inch long by ¾, and a number of rather long white roots. The racemes are slender, zigzag, and few-flowered, from one to three on a plant; they rise from the axils of one or more of the lowest leaves. The flowers, from two to five on a raceme, are white, 2 or 3 lines across. The spur is short, rather thick, and club-shaped, with the apex turned up. The capsule is elliptical, ½ an inch long, rather large in proportion to the size of the flower.

A. multiflorum, Thouars, t. 74, seems, as Moore (*l. c.*) has classed it, to be a luxuriant variety of this species.

M. OCHRACEUM, n. sp.; caule brevi; foliis angustis linearibus lanceolatis, inæqualiter bilobis, pedunculos superantibus striatis carinatis; pedunculis tenuibus rectis, vagina singula, floribus singulis parvis ochraceis; bracteis ovatis; sepalo postico lanceolato acuto erecto, lateralibus similibus reflexis; petalis angustioribus brevioribus acutis; labello cymbiformi acuto; calcare filiformi, apice clavato; columna brevissima crassa; anthera depressa biloba; ovario a latere torto, pedicello brevi.

Ankafana, *Deans Cowan* ! *in Herb. Brit. Mus.*

The affinity of this plant is with *M. caulescens.* The stem is as short as in that species, and the habit is much the same. The leaves are narrow, 4 inches long by ¼ in diameter, narrowed at the base; the peduncles very slender, 3 inches long, with a single dark-coloured close-fitting sheathing-leaf, and bearing at the apex a single yellowish ochreous flower, rather larger than that of *M. caulescens.* The petals and sepals are rather narrow and acute, the latter erect or reflexed, the former carried forwards over the lip. The lip is not flattened but concave and somewhat boat-shaped, acute at the tip, a little longer than the petals. The spur is long and slender, pendulous or spreading, filiform, with the apex a little dilated. The ovary is short and remarkably twisted sideways; the spur running across the twisted portion.

MYSTACIDIUM INAPERTUM, *mihi.* — Angræcum inapertum, *Thouars, Orch. Iles Afr.* t. 50; *Lindley, Gen. & Sp. Orch. Pl.* p. 247; *S. Moore in Flora of Maur. and Seych.* p. 358.

M. caule semipedali; foliis paucis lanceolatis angustis acutis, apice bilobis, 2½-uncialibus; pedunculis paucis tenuibus brevibus paucifloris; bracteis minimis ovatis; floribus parvis inapertis viridibus; petalis sepalisque angustis lanceolatis acutis; labello subsimili subæquali; calcare brevi curvo, quam ovarium multo breviori, clavato obtuso horizontali; ovario angulato oblongo.

Madagascar, Ankafana, *Deans Cowan*! *in Herb. Brit. Mus.* Mauritius, *Thouars, Bojer.* Bourbon, *Thouars.*

This curious plant is represented by a couple of stems with leaves and a single flower, together with a coloured drawing, in Deans Cowan's collection; and I have seen it nowhere else. The stems are about 6 inches high, and emit several long roots; at the top are a few, three or four, narrow leaves, 2½–2¾ inches long and about ¼ inch or rather less across. The peduncles are about ½ an inch long, and bear one or two (?) small flowers. The colour of the flower, as given by Thouars, is white. Deans Cowan figures it as green. It does not appear to open entirely, and is possibly self-fertilized. The spur is short and club-shaped, parallel with the ovary. The ovary is straight and rather sharply angled. The whole flower is half an inch in length. It seems to be most nearly related to *M. caulescens.*

§ *Eumystacidium.*

M. TENELLUM, n. sp.—Pusillum, caulibus 2–3-phyllis; foliis viridibus flaccidis obtuse lanceolatis, quam racemus brevioribus; racemis tenuibus erectis, demum nutantibus folia superantibus;

floribus minutis dissitis; bracteis ovatis obtusis quam pedicelli brevioribus; petalis sepalisque subsimilibus, ovatis obtusis brevibus; labello ovato obtuso carnosulo, lateribus erectis; calcare crasso obtuso cylindrico, quam ovarium breviore; columna brevissima; anthera depressa, stigmate oblongo-angusto; polliniis duobus, caudicula singula tenui elongata; glandula minima triangula; capsulis parvis oblongis ellipticis.

Ankafana, *Deans Cowan! in Herb. Brit. Mus.*

This little plant is allied to *M. pusillum*, Lindley, a native of the Cape. It has white flowers, according to a drawing made by Deans Cowan. The leaves are ½ an inch long and 2 lines across, broader and more flaccid than *M. pusillum.* The racemes are an inch long, the flowers 2 millim., the capsule 1 line.

MYSTACIDIUM GRAMINIFOLIUM, n. sp.; rhizomate brevi repente, caulibus erectis crebris foliosis; foliis ligulatis coriaceis obtusis bilobis striatis carinatis, marginibus minute crispis; vaginis membranaceis striatis; floribus minutis ad 6, in racemis gracillimis flexuosis laxis in axillis foliorum superiorum; bracteis ovatis vaginantibus; petalis sepalisque subsimilibus, lanceolatis acuminatis, petalis angustioribus; labello lanceolato acuminato, sepala subæquante; calcare cylindrico brevi obtuso, columna brevissima; lobis rostelli parvis obtusis; polliniis duobus; glandula parva ovali; stigmate ovali; ovario gracili erecto.

Ankafana, Martio 1881, no. 3977, *Hildebrandt*!; same loc., *Deans Cowan! in Herb. Brit. Mus.*

A very small-flowered plant, remarkable for its numerous narrow grassy leaves, somewhat like those of an *Isochilus* with an unequally bilobed apex and crisped margin. The small flowers are laxly arranged on a very slender rhachis. The petals, sepals, and lip are very similar in shape, triangular lanceolate, acuminate, giving the flower a star-shaped appearance. The spur is rather short, straight, cylindrical, and blunt.

GUSSONIA, *Richard, Orch. Maur.* p. 76.—Microcœlia, *Lindley, Orch. Pl.* p. 60.—Mystacidii species, *Bentham & Hook. f., Gen. Plant.* iii. p. 584.—Angræci species, *auct. plur.*

The original species of this genus was *G. aphylla*, Rich., which was afterwards reduced to *Angræcum.* This plant and several others closely allied to it have so many remarkable characters in common not possessed by any others in the genus *Mystacidium*, that it seems more satisfactory to restore the old genus *Gussonia*

for their reception. The extensive development of roots, forming in *G. aphylla* a dense mass, the absence of leaves at least during the flowering season, the short stem, the minute flowers, are the most important characteristics of the genus. Besides the species here described, *Angræcum globulosum*, Hochst. (*Gussonia globulosa*, mihi) appears to belong to the genus. It is a native of Abyssinia, and is remarkable for bearing a little bud-shaped cone of leaves in the centre of the mass of roots.

Epiphytæ pusillæ, aphyllæ (sub anthesin), radicibus sæpius copiosis, longis; caule brevi; floribus minutis, petalis sepalisque ovatis obtusis; calcare brevi obtuso quam pedicelli breviore; columna recta brevi; anthera apice producta acuta; polliniorum caudicula unica lineari, glandula parva, lobis rostelli linearibus porrectis.

Flores parvi, aurantiaci, calcar ferme semiunciale, cylindricum	*G. Gilpinæ.*
Flores minutissimi, labellum ovatum obtusum, calcar scrotiforme, racemus laxus 3-uncialis	*G. exilis.*
calcar clavatum, racemus brevis compactus	*G. aphylla.*
labellum trilobum, lobus medius linearis	*G. physophora.*

GUSSONIA GILPINÆ, *mihi.*—Angræcum Gilpinæ, *S. Moore*, *Journ. Linn. Soc.* xvi. p. 206.

G. radicibus longis validulis subteretibus; caule brevi, semiunciali; racemis $1\frac{1}{2}$-uncialibus plurifloris; floribus fulvis parvis, pedicellis gracilibus rectis; bracteis ovatis cucullatis obtusis patentibus, inferioribus vaginantibus; petalis sepalisque brevibus ovatis obtusis, sepalis paullo majoribus et acutioribus; labello subæquali ovato obtuso; calcare recto crassiusculo tereti, quam pedicelli parum breviore; columna recta tenui; anthera magna ovata acuminata; polliniis parvulis, caudicula lineari, basi dilatata, longa; glandula parva oblonga; rostelli lobis linearibus ascendentibus porrectis.

Antananarivo, *Miss Gilpin*!; Betsileo, *Baron* no. 199! *Herb. Kew*; Ankafana, *Deans Cowan*! *Herb. Brit. Mus.*

This plant is distinguished from the rest of the genus by its larger orange-coloured flowers, with a straight thick spur nearly $\frac{1}{2}$ an inch in length. The stem is usually short, $\frac{1}{2}$ an inch in length at most, and emits numerous rather thick roots, sometimes more than 6 inches in length, but far fewer than in either *G. exilis* or *aphylla*. Each stem bears one or two short flower-racemes, and the withered remains of some of previous years' growth. The flowers, 11 or more to a raceme, are supported on very slender pedicels ½ an inch in length, with small ovate spreading bracts. The column is larger than usual, and of very thin consistency. The anther is large and firmly attached to its filament, and, as in the other species of the genus, is prolonged in front into a sharp beak, which lies over the long rostellum. The pollinia are small, but the caudicle is long and slender, slightly dilated at the upper part, and bearing a small oblong gland. The rostellum is oblong and bent downwards over the stigma, and ends in two flat narrow lobes projecting outwards over the entrance of the spur, and slightly curved up at the end.

GUSSONIA APHYLLA, *A. Richard, Orch. Maur.* 76, t. 11. f. 1.—Angræcum aphyllum, *Thouars, Orch. Iles Afr.* t. 73; *S. Moore, in Flor. Maur. and Seych.* p. 358; *Reichb. f. in Walp. Ann.* vi. p. 907.—Saccolabium aphyllum, *Lindley, Gen. and Sp. Orch. Pl.* p. 223.

G. caule longo, radices validulas longas emittente; racemis uncialibus gracilibus; floribus minutis aggregatis; bracteis minutis ovatis acutis patentibus, pedicellis gracillimis brevibus; sepalis, petalis et labello ovatis oblongis subacutis subæqualibus; petalis paullo minoribus; calcare recto clavato, basi dilatato, apice abrupte saccato decurvo; caudicula oblonga; glandula subtriangulari; lobis rostelli linearibus porrectis.

Madagascar: Nosi-Komba in arboribus supra ora, Dec. 1879, no. 3256, *Hildebrandt*!; no special locality, *Thouars*! *in Herb. Brit. Mus.* Mauritius, on seashore round Flacq, and on Montagne Longue, *Bojer*! *Bouton.*

This plant is distinguished from the nearly allied *G. exilis* by the shorter and denser racemes, longer stem, fewer and stronger roots, and larger flowers, with a clavate spur. The pedicels of the flowers are 3 millim. long, the petals and sepals 1½ millim., equalling the spur. Thouars figures the flowers as white; Moore states that they are reddish.

G. PHYSOPHORA.—Angræcum physophorum, *Reichenbach fil. Otia Hamburg.* fasc. ii. p. 78. Resembles *G. aphylla*, but has larger flowers with a three-lobed lip. It was obtained by Hildebrandt in Nosi-Komba, no. 3255.

GUSSONIA EXILIS.—Microcœlia exilis, *Lindley*, *Gen. and Sp. Orch. Pl.* p. 61.

G. caule brevi crassiusculo ramoso, radices copiosissime emittente; racemis pluribus elongatis gracillimis triuncialibus plurifloris; vaginis pluribus acutis; floribus minutissimis; bracteis haud vaginantibus, membranaceis ovatis acuminatis; sepalis oblongis lanceolatis obtusis; petalis subsimilibus minoribus parum angustioribus; labello brevi oblongo ovato obtuso; calcare gibboso-saccato; columna brevi; anthera depressa conica; polliniis parvis oblongis; caudicula oblonga; lobis rostelli magnis triangulis.

Madagascar, *Forbes*, no. 28, *in Herb. Brit. Mus.*! *and Herb. Lindley*!

This singular little scrambling epiphyte is remarkable for the immense extent of its roots in proportion to the size of the rest of the plant. It has a short stout stem but little branched, 1 inch long and about 2 lines thick. The racemes are much longer and laxer than those of *G. aphylla*, and bear at the base a few acute sheathing-leaves. I have seen no other leaves attached to the plant, but among the roots are entangled a number of very small leathery oblong leaves, which may possibly belong to it. The bracts are not sheathing at the base, they are ovate acuminate. The flowers are among the smallest of Orchideous plants, hardly 1 millim. in length. The sepals and petals are blunt and oblong-lanceolate; the lip very short, its base forming a rather large saccate spur. The anther is rather large and somewhat firmly attached to the column. The pollinia are very small and orange-coloured. The lobes of the rostellum are foliaceous, triangular.

AERANTHUS, *Lindley*.

This genus has been removed from the neighbourhood of *Angræcum* and referred to that of *Aerides* by the authors of the 'Genera Plantarum,' apparently on the supposition that the column has a long foot like the latter genus. This is not the case in any of the specimens which I have seen, which include one of Lindley's types of the genus. The comparative scarcity of specimens in satisfactory condition for examination is probably the cause of the error. Among Deans Cowan's spirit-specimens is, however, a single flower, from the examination of which I make the following notes. The column is very short and footless, longer, however, than in most *Angræca.* The base of the lip is swollen and gibbous, forming a kind of pouch, the bottom of which is perforated vertically by the spur, so that the entrance to the spur is not placed close to the base of the column, but at some distance below, and it seems that it is the portion of the lip between the aperture and the base of the column which has been taken for the foot of the column. The structure and venation show clearly that it is a part of the lip.

The genera *Mystacidium* and *Æonia* were formerly added by Reichenbach to *Aeranthus*, which, however, seems better confined to the two original species, distinguished by the peculiar form of the labellum alluded to above, the tailed perianth, and the few-flowered slender peduncle rising from the lowest leaves.

AERANTHUS GRANDIFLORUS, *Lindley*, *Bot. Reg.* t. 817; *Gen. and Sp. Orch. Pl.* p. 243 (pars).

Madagascar, St. Marys, *Forbes! in Herb. Lindley.* Introduced in a living state and cultivated at Kew, 1824.

The only specimen that I have seen of this plant is a peduncle with a single flower in the Lindley Herbarium, taken from the plant introduced by Forbes. It is about 8½ inches in length, and covered with 7 or more dry, long, striate acute sheathing-leaves, each averaging two inches in length. Lindley, in the 'Genera and Species of Orchidaceous Plants,' reduced it to *A. Arachnites*, Lindley, from which it appears to be distinguished by the larger size, shorter and broader undulate leaves, more numerous lax sheaths on the peduncle exceeding the internodes and quite covering the peduncle, and the paler yellow-green petals and sepals and white lip.

In Deans Cowan's spirit-collection, however, is a peduncle with a flower which probably belongs to this species. The flower is about as large as that of *A. grandiflorus*, but the tails of the petals and sepals are much longer and the peduncle-sheaths much fewer, the lip and petals shorter than the sepals, which are 3 inches long, of which the tails form the greater length, 2½ inches. The lip is 1 inch in length and nearly ¾ in the broadest part. The pedicel has only one or two sheathing-leaves, which are rather long. The rostellar lobes, probably the wings of the column in Lindley's description, are small, acute, and deflexed, the stigma rather long and oblong in shape. But Lindley's plant had "alis semiovatis conniventibus supra stigma horizontaliter porrectis, stigmate subrotundo excavato."

AERANTHUS ARACHNITES, *Lindley, Bot. Reg.* sub t. 817 (Acranthes, *lapsu*); *S. Moore in Flor. Maurit. & Seych.* p. 352.—Aeranthus Arachnitis, *Hook. Bot. Mag.* no. 6034.—A. grandiflorus, *Lindley, Orch. Pl.* p. 243, *ex parte.*—Dendrobium Arachnites, *Thouars, Orch. Iles Afr.* t. 88.

Madagascar, low down on trees, Ankafana, *Deans Cowan* (*icon.*). Mauritius, *Bojer, Bouton, Ayres in Herb. Kew.* Rodriguez, *Balfour f.* (var. *Balfouri*), *fide S. Moore, l.c.*

The flowers are given as white in Thouars's figure, yellowish green in that in the 'Botanical Magazine,' and dull bluish green in Deans Cowan's figure. It is altogether a smaller plant than *A. grandiflorus*, Lindl.

ÆONIA.

A small genus of about five species, all natives of the Mascarene Islands.

ÆONIA MACROSTACHYA, *Lindley, Gen. and Sp. Orch. Pl.* p. 245. —Epidendrum macrostachys, *Thouars, Orch. Iles Afr.* t. 83.—Beclardia macrostachya, *Ach. Rich. Orch. Maur.* p. 19, t. 11. fig. 2. —Aerides macrostachyon, *Spreng. Syst. Veget.* p. 719; *Boj. Hort. Maur.* p. 313.—Aeranthus macrostachys, *Reichenbach fil. in Walp. Ann.* vi. p. 980; *S. Moore in Flor. Maur. et Seych.* p. 352.

Madagascar, Ankafana, *Deans Cowan in Herb. Brit. Mus.*! Mauritius, La Savanne, *Bojer.* Bourbon, *Balfour in Herb. Kew.*

This plant has a rather stout stem covered with imbricated linear oblong green leaves arranged distichously and slightly recurved, 5 or 6 inches in length by $\frac{3}{4}$ inch in breadth, the apices unequally bilobed. The roots are rather numerous, stout and long. The racemes, one or two to a plant, are erect, about 9 inches high, with numerous large white sweet-scented flowers. The lip is obovate and crenulate, the apex bilobed, with or without a small cusp between the two lobes. The column is rather short; the lobes of the rostellum are linear acute and thrust forward over the somewhat large stigma. The anther is helmet-shaped with an acuminate peak in front: inside are two flaps making it almost bilocular. The pollinia are circular in outline, rather flat, and with a groove. There is but one gland, which is ovate-acuminate, the broad apex being notched. Richard (*l. c.*)

figures two, whence the plant has been dissociated from its near allies *Æ. polystachys* and *Aphrodite*.

ÆONIA AUBERTI, *Lindley, Bot. Reg.* t. 817; *Gen. and Sp. Orch. Pl.* p. 244.—Epidendrum volucre, *Thouars, Orch. Iles Afriq.* t. 81; folio edition pl. iv.—Aeranthus volucris, *Reichenbach fil. in Walp. Ann.* vi. p. 900; *S. Moore in Flor. Maurit. & Seych.* p. 352.

Æ. caule longiusculo; foliis dissitis lanceolatis; racemis longis gracilibus paucifloris; floribus magnis albis; bracteis brevibus ovatis obtusis; sepalis obovatis, petalis subsimilibus parum latioribus et acutioribus; labello quam petala longiore, lobis lateralibus circa columnam convolutis, lamina biloba obovata, lobis rotundatis; calcare brevi cylindrico recto obtuso; columna brevi; lobis rostelli ovatis foliaceis.

Madagascar, *Thouars! in Herb. Brit. Mus.* Tanala, *Deans Cowan* (*icon.*). Mauritius, *fide Bojer.* Bourbon.

The flowers of this plant are as large as those of *Æ. macrostachya*, one inch across, to which species it is most nearly allied. They are white with a yellow centre, according to Deans Cowan. The stem and leaves much recall those of *Cryptopus elatus*, the latter being lanceolate and shorter, and more distant than in most of the other species of the genus. The peduncle is very long in proportion to the stem, in Deans Cowan's sketch nearly 2 feet long, while the stem is only 6 inches. The lower part bears a few distant dark-brown sheaths. The flowers are few. The petals are ½ an inch long, 5 lines across in the broadest part. The lip is 1 inch long and ½ inch in diameter. Neither in Thouars's type-specimen in the British Museum nor in Deans Cowan's drawing do I see the cusp between the lobes of the lip figured by Thouars. The leaves are figured and described by him also as acute, but, according to Deans Cowan, they are slightly unequally bilobed at the apex.

Æ. ROSEA, n. sp.; caule semipedali, radices crassiusculas emittente; foliis dissitis obtuse lanceolatis uncialibus; pedunculis paucifloris patentibus; floribus expansis mediocribus; bracteis parvis ovatis; sepalis spathulatis obtusis viridibus; labello roseo, quam sepala multo longiore, lobis lateralibus convolutis rotundatis obtusis, lobo medio multo majore, obcuneato bilobo, laciniis obtusis; calcare brevi cylindrica recta.

Madagascar, Ankafana, *Deans Cowan! in Herb. Brit. Mus.*

This species is most nearly allied to *Æ. Auberti*, of which it has exactly the habit, but the raceme is shorter and stiffer, the flowers smaller and differently coloured. The leaves are 1 inch long by ¼ in diameter. The peduncle 1¾ inch long, the flower ½ an inch in diameter.

ÆONIA POLYSTACHYA, *Benth. & Hook. f. Gen. Plant.* p. 584. —Epidendrum polystachys, *Thouars, Orch. Iles Afriq.* t. 82.— Listrostachys polystachys, *Reichb. fil. in Walp. Ann.* vi. p. 909; *S. Moore, in Flor. Maur. and Seych.* p. 354.—Angræcum polystachyum, *Rich. Orch. Maur.* p. 74, t. 10. f. 2; *Lindley, Comp. Bot. Mag.* ii. p. 205.

Æ. caule brevi, foliis caulem amplectentibus oblongis loratis, inæqualiter bilobis; racemis sæpe longis erectis laxis; bracteis brevibus ovatis laxis; floribus mediocribus; pedicellis brevibus; sepalis lanceolatis acuminatis acutis viridibus patentibus; petalis subsimilibus, angustioribus brevioribus; labello albo, sepalis subæquilongo, lobis lateralibus circa columnam convolutis, parum crenulatis, lamina rotundata, cuspide acuminata longa; calcare brevi clavato saccato; lobis rostelli porrectis; caudiculis polliniorum linearibus, glandula ovata emarginata.

Madagascar, *Thouars! in Herb. Brit. Mus.* Bourbon, *Thouars.* Mauritius, *Bojer.*

The leaves are about 8 inches long by 5 lines in diameter. The raceme in the type-specimen is 6 inches long, the flowers rather distant. The sepals are 7 lines long, the lip including the cusp is of the same length, the latter is ¼ inch. In Thouars's figure the flowers are given as entirely white; but in plants flowered by Mr. Christy at Sydenham, March 1885, the sepals and petals were light green and the lip white.

CRYPTOPUS.

This monotypic genus is confined to the Mascarene Islands. The only evidence I have of its being a Madagascar plant is a flowerless specimen collected by Lyall, which necessarily is rather doubtful. It seems, however, common in Mauritius, and will probably be found in Madagascar when the eastern coast is more fully explored.

C. ELATUS, *Lindley, Bot. Reg.* sub t. 817; *Hook. Journ. Bot.* i. p. 45, t. 115; *S. Moore, in Flora Maurit. and Seych.* p. 349.— Angræcum elatum, *Thouars, Orch. Iles Afriq.* t. 79.—Beclardia elata, *Richard, Orch. Maur.* p. 78, t. 11. fig. 3.—Epidendrum dipterum, *Sieber, Herb. Maur.* no. 210.

Madagascar? *Lyall! in Herb. Kew.* Mauritius, *Sieber, Herb. Maurit.* 210! *in Herb. Brit. Mus.* Bourbon, *Richard! in Herb. Lindley.* Sine loc., *Thouars! in Herb. Brit. Mus.*

Aerides coriaceum, *Swartz, Schrad. Diar. Bot.* 1799, p. 234; *Willd. Spec. Plant.* iv. p. 131.—Saccolabium coriaceum, *Lindley, Gen. and Sp. Orch. Pl.* p. 224, from Madagascar, is quite indeterminable.

NEOTTIEÆ.

CORYMBIS, *Thouars.*

Corymbis, *Thouars, Orch. Iles Afr.* table i.—Corcurborchis, *ibid.*—Corymborchis, *Thouars, fide Blume.*—Hysteria, *Reinwardt, Blume Cat. Hort. Buitenz.* p. 99.—Rhynchanthera, *Blume, Bijdr.* fig. lxxviii.—Macrostylis, *Kuhl & Hasselt. ed. Breda*, fasc. 1, t. 2.

A small genus of six or seven species scattered over the tropics of both Worlds.

C. CORYMBOSA, *Thouars, Orch. Iles Afr.* tt. 37, 38.—C. Thouarsii, *Reichb. f. in Bot. Zeit.* 1849, p. 868.—C. disticha, *Lindley, Folia Orchidacea* (pars).—Corymborchis Thouarsii, *Blume, Orch. Ind. Archipel.* p. 126, pl. 44. fig. 1, A–C.

Madagascar, Nossibé, *Pervillé* no. 142. Bourbon, *Thouars.* West Africa, Ins. St. Thomas, *Don in Herb. Brit. Mus.*

This species is nearly allied to *C. veratrifolia*, Blume, with which it was confused by Lindley under the name of *C. disticha*, from which it is distinguished by its smaller flowers and always persistent column and robuster habit.

Blume quotes *Corymborchis* as the original name given by Thouars to the genus; but in the copy of the 'Orchides d'Iles d'Afrique' in the British-Museum Library, the name is *Corcurborchis* in the synoptical table and *Corymbis* on the plate.

POGONIA.

The only species of this genus that occur in the tropics of the Old World belong to the section *Nervilia.* Two are found in the Mascarene Islands, *P. Thouarsii*, Blume (*Arethusa simplex*, Thouars, *Aplostellis ambigua*, Rich., *Haplostellis truncata*, Lindley), a native of Mauritius; and *P. Renschiana*, Reichenbach, Otia Hamburg, i. p. 73, which was found in Nossibé by Hildebrandt, no. 3383.

Gymnochilus.

This genus consists of two species, both confined to the Mascarene Islands, one a native of Madagascar, the other of Mauritius and Bourbon. They are low-creeping terrestrial plants, resembling the genus *Goodyera*, from which they are distinguished by the narrow entire lip. G. recurvus, *Blume, Orch. Archip. Ind.* p. 109, t. 32. fig. 2, was collected in Madagascar by Bruguières; it is distinguished from the Mauritius and Bourbon plant *G. nudus*, Blume, l. c., *Goodyera nuda*, Thouars, by its oval leaves, nodding raceme, and bracts longer than the ovary.

Monochilus.

The only species belonging to this genus known to me as a native of Madagascar has more of the habit of a *Gymnochilus* than of a *Monochilus*; but the produced bifid lip, with a pair of calli at the base, distinguish it from the former genus. The remaining species are natives of the Indo-Malayan region, with one or two African and one, *M. Boryi*, Reichb. fil., a native of Bourbon.

M. gymnochiloides, n. sp.—Herba terrestris, rhizomate longe repente, caule subpedali, parte suprema pubescente; foliis remotis ovatis lanceolatis, petiolatis glabris, petiola vaginante, membranacea; racemo denso, bracteis lanceolatis acuminatis pubescentibus, ovario subæquantibus; floribus parvis, circiter viginti; sepalis ovatis connatis; petalis angustioribus obtusis subæqualibus; labello basi ventricoso, ad columnam et sepala adnato, carnosulo, callis duobus cornutis obtusis decurvis; lamina biloba rotundata lata deflexa, marginibus crispulis; columna brevi; anthera erecta, loculis distinctis, polliniis 2 pyriformibus sectilibus, apicibus attenuatis; rostello erecto bifido.

Imerina, December 1880, *Hildebrandt* no. 3800! *in Herb. Brit. Mus.* Central Madagascar, *Baron* n. 2842! *in Herb. Brit. Mus.*

A small terrestrial plant with the habit of *Gymnochilus nudus*, Blume. The rhizome is long and creeping, and throws up a stem less than a foot in height, which bears several rather distant ovate-lanceolate leaves 2 inches long, including the petiole, and ¾ to 1 inch across. The lower part of the stem is glabrous; but above the highest leaf it is pubescent, and bears about four sheathing lanceolate bracts about ½ inch in length. The raceme is crowded and slightly nodding, an inch in length, containing about twenty small flowers. The bracts are as long as the ovaries, and, like them, pubescent. The basal portion of the lip is dilated and somewhat fleshy; at the base are two short blunt down-curved processes, between which runs a raised line. The terminal portion of the lip is developed into a broad rounded two-lobed deflexed lamina. The pollen-gland is ovate, and projects in front of and behind the point of attachment of the pollinia, which are rather coarsely granular. The ovary is 3 lines long, narrowed at the upper end.

OPHRYDEÆ.

BICORNELLA, *Lindley*.

This small genus seems to be endemic. It contains three species.

Folia radicalia brevia;
  lobi laterales rostelli breves cornuti, curvi;
    racemus compactus .... *B. parviflora.*
  lobi laterales rostelli elongati, porrecti;
    racemus laxus .... *B. gracilis.*
Folia elongata, caulis elatus .... *B. longifolia.*

B. GRACILIS, *Lindley, Genera & Species Orchid. Pl.* p. 334. (Plate XV. figs. 1–4.)

B. radicibus copiosis cylindricis; caule erecto gracili pedali; foliis linearibus acuminatis strictis, quam caulis multo brevioribus; racemo laxo multifloro, floribus parvis roseis; bracteis sæpius quam ovarium brevioribus; petalis et sepalo postico connatis galeam cucullatam ovatam acutam efformantibus; sepalis lateralibus falcatis ovatis obtusis; labello lobis lateralibus quam processus rostelli haud longioribus, lobo medio lineari-lanceolato angusto velutino; calcare brevi, dimidio ovarii æquante, pendulo, basi angustato vix clavato; lobis rostelli lateralibus elongatis linearibus spathulatis obtusis porrectis; polliniis minimis; caudiculis capillaceis; ovario sæpius scabro.

Madagascar, *Lyall* no. 308! Tsipelina, *Parker*! *Baron* no. 202! *in Herb. Kew.* In paludibus Ankafana, Imerina! *Deans Cowan.* Sine loc., *Hilsenberg and Bojer*!; *J. V. Thompson*! *in Herb. Brit. Mus.*

B. PARVIFLORA, n. sp. (Plate XV. figs. 5–9); radicibus multis cylindricis; foliis radicalibus paucis linearibus acuminatis brevibus; caule erecto gracili vix pedali; floribus numerosis parvis aggregatis roseis; bracteis linearibus acuminatis, quam ovarium sæpius brevioribus ; sepalo postico cucullato obtuso ; petalis brevioribus ovatis obtusis, cum illis galeam efformantibus sed liberis ; sepalis lateralibus majoribus ovatis obtusis falcatis ; labello lobo medio lanceolato obtuso, lobis lateralibus vix distinctis reflexis, basi ad columnam adnatis ; calcare pendulo basi angustato, apice subclavato, dimidium ovarii superante ; lobis rostelli lateralibus cornutis obtusis suberectis, medio multo breviore; polliniis parvis subglobosis ; caudicula tenerrima longiuscula, glandula minima ovali ; ovario vix scabro basi et apice angustato ; capsula brevi oblonga glabra subcylindrica.

Imerina, *Deans Cowan* ! ; ibidem in marginibus oryzetorum, Jan. 1881, *Hildebrandt* no. 3820 ! *in Herb. Brit. Mus.* ; *Lyall* no. 308 !, mixed with *B. gracilis*, Lindl., *Herb. Kew.*

This species is easily distinguished from the other two by its smaller flowers arranged in a more compact spike, and the short up-curved horn-like rostellar lobes. The plant is, on the whole, a good deal smaller and more slender than the other two species, being from 6 inches to nearly 1 foot in height. The leaves are fewer, the radical ones linear and grassy, those on the stem somewhat similar, but with a rather long sheath. The petals and dorsal sepals form, as in the rest of the genus, a galea ; but they are not connate as is the case in *B. gracilis.* The petals are shorter than the posticous sepal. The lateral sepals resemble in shape those of the other species of the genus, but are a good deal larger than the petals and posticous sepal. The lip has a narrow middle lobe, up-curved in the living state. The lateral lobes, which are narrow, and hardly to be distinguished from the rest of the lip when it is spread out, are adnate to the column as in the rest of the genus, but are longer, and, being reflected, form a channel to the entrance of the spur for nearly half the length of the entire lip. The lateral lobes of the rostellum are much shorter than those of the other species, horn-shaped and curved-up in front of the anther ; the median lobe is shorter and blunt. The caudicles of the pale orange pollinia are proportionally shorter than in the other two species, but longer than might be expected from the size of the flower. The capsule is quite glabrous, smaller and thicker in proportion to its length than that of *B. longifolia,* Lindl. The habit of the plant is much like that of *Habenaria* (*Gymnadenia*) *conopsea.*

BICORNELLA LONGIFOLIA, *Lindley, Gen. & Sp. Orch. Pl.* p. 335.

B. radicibus copiosis cylindricis tenuibus ; caule erecto elato,

ultra bipedali; foliis longissimis gramineis flaccidis linearibus acuminatis, quam caulis paullo brevioribus; racemo plurifloro laxiusculo; floribus parvis; bracteis linearibus acuminatis, quam ovarium nonnunquam longioribus; galea cucullata obtusa, sepalis lateralibus ovalibus falcatis obtusiusculis; labello lineari lanceolato acuminato crispo obtuso; calcare filiformi pendulo brevi; columna brevissima, lobis rostelli brevioribus et crassioribus quam in præcedente, obtusis; ovario minus scabro; pedicello longiore; capsula oblonga.

Madagascar: insula Sancta Marie, *Boivin*! *in Herb. Brit. Mus.*

This is a taller plant than *B. gracilis*, Lindl., attaining a height of 2½ feet, with numerous straight fibrous roots and flaccid linear acuminate grassy leaves a foot in length. The raceme is long and rather lax; the flowers rather smaller than those of the preceding species, the ovary less scabrous, and the bracts in proportion a little longer, the lower ones overtopping the ovary. The apex of the galea is blunter, the lobes of the rostellum shorter, thicker, and more obtuse. The capsule is rather large for the size of the flowers, 4 lines long by 1½ in section, oblong in shape.

HABENARIA.

§ *Peristylus.*

HABENARIA SPIRALIS.—Satyrium spirale, *Thouars, Orch. Afr.* t. 9.—Benthamia spiralis, *Rich. Orch. Maur.* p. 44.—Spiranthes africana, *Lindley, Spreng. Syst. Végét.* iii. p. 709.—Peristylus spiralis, *S. Moore in Flora Maur. and Seych.* p. 335.

Madagascar, *Hilsenberg & Bojer*! N. Betsileo-land in paludibus, *Hildebrandt* no. 3975! Imerina, *Deans Cowan*! *Herb. Brit. Mus.*; *Baron* no. 849! *Parker*! *Herb. Kew.* Mauritius, *Bouton*! *Ayres*! *in Herb. Kew.* Bourbon, *Balfour*! Ins. Mascarenes, *J. Macgregor*! *Herb. Brit. Mus.*

Apparently a common plant, with rather large tubers ¾ inch long, a slender stem a foot high, narrow grassy erect leaves 3 to 4½ inches high, and a rather lax raceme of numerous small flowers. The bracts are 3 lines in length, a little longer than the ovary. The sepals and petals are similar both in size and shape, ligulate and blunt; but the latter are very fleshy and dark-coloured in the dry state, while the former are thin and pale. In a drawing made by Deans Cowan, the sepals are light green and the petals yellow; and in Thouars's figure the whole flower is green; but a note fixed to a specimen collected by Parker in the Kew Herbarium says "flowers pink." The lip is short and three-lobed; the edges at the base are reflexed so as to form a channel to the spur. The lobes are short and blunt, the median one the longest, all thick and fleshy, especially at the apex. The spur is very short and sac-like. The column is very short, and bears two small lateral, ovate, erect auricles.

HABENARIA MINUTIFLORA, n. sp.; tuberibus digitatis; caule sæpe gracillimo debili pedali; foliis linearibus lanceolatis flaccidis acutis; racemo laxo; floribus minutis remotiusculis; bracteis linearibus acuminatis, ovario subæquantibus; sepalis petalisque subæqualibus subsimilibus lanceolatis ligulatis obtusis; labello obtuse trilobo, sepalis subæquante, lacinia media longiore obtuse lanceolata carnosula, lateralibus brevissimis obtusis reflexis; calcare scrotiformi parvo; columna brevissima.

Andrangoloaka, E. Imerina in sylvis umbrosis, Nov. 1880, *Hildebrandt* no. 3729! *in Herb. Brit. Mus.*

An inconspicuous plant, related to *H. spiralis*, but with broader flaccid leaves, 5 inches long by ¼ inch across, a weak slender stem 1 foot high, and a raceme of somewhat distant very small flowers. The whole plant dries black.

H. MISERA, n. sp.; foliis 2, ovatis vel ovatis lanceolatis, cuspidatis; caule in toto florifero gracili laxo; bracteis lanceolatis flores bis superantibus; floribus minutis; sepalis lateralibus ovatis lanceolatis obtusis, postico latiore; petalis brevioribus lanceolatis carnosulis; labello integro ovato brevi, apice carnoso, basi excavato, marginibus erectis; calcare brevissimo saccato; apicibus antherarum brevibus divergentibus; anthera brevissime apiculata.

Imerina, *Deans Cowan*! *in Herb. Brit. Mus.*

This plant is closely allied to *H. minutiflora*, but is distinguished by its oval cuspidate leaves and shorter ovary and entire lip.

H. HILDEBRANDTII, n. sp.—Herba gracillima; tuberibus parvis ovalibus cylindricis; foliis paucis linearibus acuminatis; caule gracili 9–15-unciali; racemo longiusculo 2½-unciali compacto plurifloro; floribus minimis quaquaversis; bracteis linearibus acuminatis, ovario æquantibus vel paullo longioribus; sepalis petalisque ovatis obtusis brevibus subæqualibus; labello ovato lanceolato obtuso integro, basi concavo, apice carnosulo; calcare nullo vel brevissime sacculato; columna brevissima crassa; lobis stigmaticis parvis obtusis.

Montes Ankaratra in paludosis, Jan. 1881, *Hildebrandt* no. 3860!; Imerina, in paludosis Ankafana (icon.), *Deans Cowan*! *Hilsenberg & Bojer*! *in Herb. Brit. Mus.*

Although this plant often has a very short sac-shaped spur, yet, as in other respects it resembles the genus *Herminium*, I feel compelled to refer it here. It differs from *H. spirale*, Reichb. f., in its narrow grassy leaves and the arrangement of the flowers, which are very small, yellow, numerous, and crowded with short blunt petals and sepals, and a small ovate lip curiously excavate at the base, with the edges revolute and slightly thickened, and the apex thick and fleshy. The whole plant dries black.

HABENARIA FILIFORMIS.—Peristylus filiformis, *Kranzlin, Verh. Brem.* vii. p. 258, must be allied to this plant. It was obtained near Antananarivo by Rutenberg.

H. GRAMINEA, *Spreng. Syst.* iii. p. 390; *Bojer, Hort. Maur.* p. 310; *Kranzlin, Verh. Brem.* vii. p. 259.—Platanthera graminea, *Lindley, Gen. et Sp. Orch. Pl.* p. 292.—Satyrium gramineum, *Thouars, Orch. Iles Afr.* t. 6.—Peristylus gramineus, *S. Moore, in Flor. Maur. & Seych.* p. 336. It was originally discovered in Madagascar by Thouars, and later by Rutenberg at Ambatomainty. It is also recorded from Mauritius by Bojer.

§ *Euhabenaria.*

H. PAPILLOSA, n. sp.; tuberibus parvis ovalibus; caule erecto gracillimo, pedali vel ultra; foliis radicalibus nullis vel uno parvo lanceolato-acuminato; caulinis linearibus acuminatis remotis; racemo sæpius compacto plurifloro; floribus minimis; bracteis lanceolatis acuminatis, ovario subæquantibus; sepalo postico oblongo ovato obtusissimo, lateralibus ovatis lanceolatis obtusis erectis; petalis brevioribus acutioribus; labello oblongo, quam sepala lateralia breviore, deflexo trilobo pubescente; lobis lateralibus perparvis nonnunquam vix distinctis, medio oblongo obtuso; calcare brevi cylindrico, $\frac{1}{4}$ ovarii æquante, obtuso; columna brevissima, processubus stigmaticis crassiusculis brevibus papillosis.

Montes Ankaratra, Jan. 1881, *Hildebrandt* no. 3860!; Imerina, *Deans Cowan*! *in Herb. Brit. Mus.*

This plant is chiefly remarkable for the absence in most specimens of radical leaves. Only one example have I seen with any, and that had but one lanceolate leaf ½ an inch long. There are, however, a few small stem-leaves, lanceolate-acuminate. The flowers are small, and arranged in an unusually compact spike. The lip is short, pubescent, and blunt, faintly three-lobed, the lateral lobes being often hardly more than denoted by notches. The stigmatic processes are short and thick, and closely covered with rather large papillæ; and there are also little lateral papillose wings to the column, which is very short. The apices of the anther are very short, but the lobes are very deeply divided. The spur is short, only one fourth of the ovary. The flowers appear to be light-coloured, but the lip is dark pink.

Closely allied to this plant must be *H. depauperata*, Kranzlin, Verh. Brem. vii. p. 259, collected by Pervillé at Ambongo and Efitra by Rutenberg. I have seen no specimens; but it appears to differ in the entire lip, the form of the anther, and laxer and fewer-flowered raceme.

HABENARIA TENERRIMA, n. sp.—Pusilla; foliis 2–3 radicalibus lineari-lanceolatis acutis brevibus; caule gracili, vaginis 1–2 remotis ampliatis; racemo laxo paucifloro (7); floribus parvis; bracteis lanceolatis, breviter acuminatis, ovario dimidio æquantibus; sepalis petalisque lanceolatis obliquis obtusiusculis; petalis brevioribus; labello cuneato emarginato pubescente, marginibus ad basin incrassatis reflexis; calcare infundibuliformi leviter curvo, versus apicem sensim attenuato, dimidio ovarii æquali, processubus stigmaticis brevibus crassis rectis.

Andrangoloaka, E. Imerina, in paludibus, Nov. 1880, *Hildebrandt* no. 3732! *in Herb. Brit. Mus.*

A small species, from 4 to 6 inches tall, with a few narrow lanceolate leaves ¾ inch long, and a lax raceme of at most seven apparently rose-coloured small flowers.

H. IMERINENSIS, n. sp.; radicibus copiosis longis; foliis lanceolatis spathulatis cuspidatis flaccidis, basi angustatis; caule gracili pedali vel paullo ultra, 3-vaginato, vaginis ampliatis acuminatis, racemo laxo; floribus 8–13 roseis; bracteis lanceolatis acuminatis, ovarii dimidio æquantibus; sepalo postico ad petala omnino adnata, galeam obtusam formante, lateralibus ovatis obtusis deflexis; labello trilobo, lobis lateralibus parvis obtusis, medio elongato lineari acutiusculo porrecto; calcare pendulo

subclavato obtuso; anthera reclinata, apicibus brevibus; rostello brevi; processubus stigmaticis brevibus crassis papillosis; ovario gracili fusiformi.

E. Imerina, Andrangoloaka, in sylvis umbrosis, Nov. 1880, *Hildebrandt* no. 3731! *in Herb. Brit. Mus.*

This plant is chiefly remarkable for the anchylosis of the petals and dorsal sepal, which is so complete that it is almost impossible to trace their point of junction except by the venation. The anther is thrown back very far, so that its dorsal surface is almost at right angles to the top of the ovary. The stigmatic lobes are short, thick, and papillose. The stem is from 12–15 inches high; the leaves are lanceolate, the lower part tapering into a petiole, the apex terminated by a small cusp.

HABENARIA BIMACULATA, n. sp.; foliis radicalibus paucis flaccidis lanceolatis, basi angustatis; caulinis 4–5 remotis lanceolatis acuminatis; caule sesquipedali debili, racemo laxo multifloro; bracteis lanceolatis acuminatis, ovarii dimidio æquantibus; sepalo postico et petalis lanceolatis acutis subæqualibus conniventibus, lateralibus lanceolatis patentibus; labello obovato rotundato, obscure trilobo, crenulato lilacino, maculis duabus oblongis purpureis; calcare dimidio ovarii æquante, pendulo, abrupte uncato obtuso; antheræ apicibus brevissimis; processubus stigmaticis brevibus crassis obtusis; ovario scabro fusiformi.

Imerina, Ikangosoa, *Deans Cowan in Herb. Brit. Mus.*!

A weak plant, about 15 inches in height, with two or three flaccid green radical leaves 5 inches long by $\frac{3}{4}$ inch in diameter, lanceolate and narrowed at the base so as to be almost petiolate. The stem bears four or five smaller lanceolate distant leaves passing into bracts, and is terminated by a short raceme of lilac flowers. The lip is broad and more or less three-lobed; it is also lilac, but has two oblong dark purple spots in the centre. The spur is remarkable for being hooked. The ovary is scabrous.

The colouring is taken from a drawing of Deans Cowan's.

H. PURPUREA, *Thouars, Orch. Iles Afr.* t. 17; *Lindley, Gen. & Sp. Orch. Pl.* p. 317.—Peristylus purpureus, *S. Moore, in Fl. Maur. Seych.* p. 335.

H. foliis radicalibus, lanceolatis acuminatis vel obtusis, sæpius patentibus; caule pedali 3-vaginato, vaginis ampliatis brevibus acuminatis; racemo laxo; floribus 9–12 mediocribus purpureis; bracteis ovatis lanceolatis acuminatis, dimidio ovarii æquantibus

sepalo postico parvo ovato lanceolato, cum petalis angustioribus galeam formante, lateralibus late ovatis obtusis obliquis, quam posticum multo majoribus; labello cuneato trilobo, lobis lateralibus latis ovatis obtusis, medio lineari longiore, calcare brevi crasso curvo, apice clavato viridi; anthera apiculata, apicibus brevibus crassis; rostello triangulari; ovario gracili glabro.

Madagascar: Bara! Imerina, *Deans Cowan*!, *Hildebrandt* no. 3495!; Ivatolo, valley to the north!, *Deans Cowan*; no specific locality, *Hilsenberg & Bojer*! *in Herb. Brit. Mus.*; Andramasina, *Parker*! *Baron* 623!; coast to capital, *Langley Kitching*! *in Herb. Kew.* According to Bojer it occurs also in Mauritius.

This seems to be a common and striking plant in Madagascar. It has four or five lanceolate leaves, 3 to 5 inches long, ½ an inch across at the base of the stem, which is barely 1 foot in height, and terminated by a loose spike of 9–12 purple flowers. The bracts are ¼ of an inch long, the ovary ½. The lateral sepals are large and spreading, 3 lines long by 2 across. The spur is remarkably short, curved up under the lip, and clubbed at the end. The lip is oblong cuneate, ¼ inch long; the lateral lobes obtuse, short, and spreading; the middle one narrow and straight.

Habenaria nutans, n. sp.—Subpedalis; foliis 1–2 radicalibus late lanceolatis acutis, basi angustatis, racemo laxo multifloro nutante; floribus mediocribus roseis; bracteis membranaceis lanceolatis acuminatis, dimidio ovarii æquantibus; sepalo postico cucullato ovato obtuso; sepalis lateralibus ovatis lanceolatis obtusis obliquis porrectis, petalis subæquantibus; petalis ovatis oblongis obtusis; labello angusto lineari, sepalis lateralibus subæquali, ad basin columnæ adnato; calcare filiformi acuminato, quam ovarium triente breviore; columna brevi, apicibus antheræ recurvis; processubus stigmaticis crassis brevibus latis curvis, apicibus papillosis; ovario semiunciali pubescente.

Madagascar: Central, *Baron*, no. 1703!; Imerina, *Deans Cowan*, *Herb. Brit. Mus.*; Andrangoloaka, *Parker*! *Herb. Kew.*

This plant is related to *H. citrina*, Thouars. It has elongate tubers, and a rather weak stem 7 inches in height, terminated in a rather broad but loose nodding head of purple flowers, as large as those of *H. purpurea*, Thouars. There is one, more rarely two, broad lanceolate leaves 4½ inches in length by nearly 1 in breadth. The hooded dorsal sepal with the petals forms a galea. The lateral

sepals are ovate-lanceolate, with the apices curved up. The lip is narrow and entire, with a cylindrical spur 4 lines long. The stigmatic arms are remarkable for being rather thick and broad, curved over the base of the lip and entrance to spur, and papillose at the extremity. The lip is attached to the base of the column. The ovary is 6 lines in length, elongate, curved, and pubescent. Altogether the plant has much the appearance of a *Cynorchis*, from which genus the short anther-points distinguish it.

HABENARIA ARACHNOIDES, *Thouars, Orch. Iles Afr.* t. 18; *Lindley, Gen. and Sp. Orch. Pl.* p. 308.

H. tuberibus oblongis, radicibus etiam cylindricis longis; caule erecto folioso tereti pedali; foliis lanceolato-acuminatis amplexicaulibus patentibus flaccidis; racemo laxo longo; floribus parvis; bracteis lanceolatis acuminatis, inferioribus ovarium superantibus; sepalo postico ovato obtuso, lateralibus ovatis subacutis deflexis; petalis bipartitibus laciniis linearibus erectis acuminatis, exteriore longiore pubescenti; labello trilobo, lobis lateralibus anguste linearibus acuminatis, minute pubescentibus, medio breviore obtuso; calcare filiformi-clavato, ovario subæquali; columna brevi crassa; antheræ apicibus productis longiusculis; processubus stigmaticis linearibus clavatis obtusis, quam anthera longioribus; caudiculis polliniorum rectis capillaceis, glandulo minuto ovali; ovario scabro.

Madagascar, Tanala! *Langley Kitching, in Herb. Kew*; Ankafana, *Deans Cowan*!; S. Betsileo, Ankafana, 3932, *Hildebrandt*! *in Herb. Brit. Mus.*

This is, I believe, the plant figured by Thouars as *Habenaria Arachnoides.* The stem is from 1 foot to 14 inches in height, leafy almost up to the flowers. There is usually a single oblong tuber about ½ to ¾ of an inch in length, and a number of simple cylindrical roots. The leaves are lanceolate-acuminate; the bases, a little dilate, clasp the stem; there are six or eight on each stem. They are 3½ inches long and ½ in diameter at the broadest part; like the rest of the plant they dry black, but are paler in colour beneath. The flowers are in a lax raceme, about twenty in number; Thouars's figure gives them as white. The dorsal sepal is hooded, blunt, the laterals a little larger, and more acute or deflexed. The petals are bifid, the lobes narrowly linear, the one nearest to the column is the shorter and more blunt than the other, almost spathulate in shape; the other lobe is pubescent along the

margins. The lip is three-lobed, the middle lobe the shortest and bluntest; the laterals narrowly linear acuminate, minutely pubescent. The spur is filiform, slightly dilated before the tip, about as long as the ovary (5 lines). The base of the anther is prolonged in the form of two short processes, which bear the slender caudicles. The stigmatic lobes are rather long, straight, and blunt, projecting over the entrance to the spur. The gland of the caudicles is minute, circular.

HABENARIA SIMPLEX, *Kranzlin, Verhand. Bremen*, vii. p. 260. —Efitra, *Rutenberg*.

H. ALTA, n. sp.; tuberibus elongatis, radicibus crebris lanatis, caule elato valido; foliis pluribus ovatis acutis; racemo laxo longo; floribus copiosis parvis; bracteis lanceolatis, ovariis æquantibus; sepalo postico ovato lanceolato, lateralibus longioribus; petalis bifidis, laciniis anguste lanceolatis, postica quam antica longiore; labello trilobo, sepalis lateralibus æquante, lobis linearibus, medio longiore et latiore; calcare cylindrico versus apicem incrassato curvo, ovario æquante; anthera haud apiculata, apicibus brevibus crassiusculis rectis; processubus stigmaticis cochleatis porrectis, apicibus antheræ æquantibus; ovario curvo, basi et apice angustato.

Ankafana, *Deans Cowan* ! *in Herb. Brit. Mus.*

This plant is allied to *H. malacophylla*, Reichb. f., and to *H. arachnoides*, Thouars, differing from the latter in its broader ovate leaves and smaller flowers. It attains a height of 2½ feet, and dries entirely black.

H. TRUNCATA, *Lindley, Gen. & Sp. Orch. Pl.* p. 311.

Pedalis; foliis ovato-lanceolatis acuminatis appressis pluribus; racemo denso cylindrico; bracteis lanceolatis, flores superantibus; floribus parvis flavescenti-viridibus; sepalo postico ovato obtuso; sepalis lateralibus lanceolatis ligulatis obtusis; petalis bipartitis, laciniis angustis linearibus; labello trifido, lobis linearibus subæqualibus, medio paullo latiore; calcare quam ovarium breviore truncato subclavato.

Madagascar, *Lyall* ! *in Herb. Kew.* There is a drawing of this plant in Deans Cowan's collection, labelled "on dry grassy plains, very common everywhere, Ankafana, perfumed."

H. HILSENBERGII, n. sp.; caule flexuoso folioso; foliis ensiformibus linearibus lanceolatis acuminatis strictis, caulem amplec-

tentibus; racemo denso cylindraceo; floribus parvis; bracteis linearibus acuminatis; sepalo postico ovato obtuso; lateralibus majoribus ovatis obtusis deflexis; petalis bipartitis, laciniis linearibus oblongis obtusis, postica longiore; labello trilobo carnosulo basi angustato, lobis lateralibus brevibus linearibus oblongis obtusis falcatulis, medio longiore oblongo obtuso; calcare quam ovarium longiore, filiformi; apicibus antheræ brevibus crassiusculis; processubus stigmaticis brevibus latis; ovario scabro.

Madagascar, *Hilsenberg & Bojer! in Herb. Brit. Mus.*

This species is nearly allied to *H. truncata*, Lindley, which it much resembles. It is distinguished by its shorter and blunter petals and lobes of the lip, and its longer filiform spur not truncate. The stigmatic lobes are short and broad, as long as the base of the lip to the point of the trifurcation. The whole plant dries black.

HABENARIA STRICTA, n. sp.; caule pedali dense folioso; foliis appressis linearibus lanceolatis acutis angustis; racemo laxiusculo; floribus pluribus appressis; bracteis ovaris æquantibus vel superantibus, lanceolatis acuminatis; sepalis lanceolatis acutis, lateralibus quam posticum paullo longioribus; petalis erectis lanceolatis angustis acutis; labello carnoso trilobo, lobis linearibus angustis obtusis; calcare longo pendulo unciali versus apicem incrassato; anthera erecta, brevissime apiculata, apicibus inferis longis cylindricis, abrupte recurvis; processubus stigmaticis ovatis obtusis brevibus crassiusculis.

Imerina, *Deans Cowan! in Herb. Brit. Mus.*

This plant is distinguished from the preceding species by its numerous strict narrow leaves and many-flowered raceme. The stem is about a foot in height, covered with the appressed leaves, of which the longest are about 2½ inches in length. The flowers are about the size of those of *Habenaria Arachnoides*, Thouars, closely appressed to the stem. The dorsal sepal narrow and excavate, acute, the laterals are deflexed. The column has two small lateral obtuse lobes flanking the entrance to the spur.

HABENARIA INCARNATA, *Reichenbach fil. in Flora*, 1865, p. 180. —Bonatea incarnata, *Lindley, Genera & Species Orch. Pl.* p. 327. —*Lyall! Baron* no. 213! *in Herb. Kew.*

H. RUTENBERGIANUM, *Kranzlin, Verhand. Bremen*, vii. p. 258. —Antananarivo, *Rutenberg.*

HABENARIA CIRRHATA, *Reichenbach fil. Flora*, 1865, p. 180.—Bonatea cirrhata, *Lindley, Gen. & Spec. Orch. Pl.* p. 327.

H. tuberibus oblongis; caule folioso sesquipedali; foliis oblongo-lanceolatis striatis acutis; racemo laxo paucifloro; bracteis longis lanceolatis, ovario longe pedunculato subæqualibus; sepalo postico lanceolato acuto, lateralibus obcuneatis obliquis; petalis bifidis, lacinia postica angustissima lineari, antica angustissima lanceolata acuminata; labello trilobo, basi brevi subtriangulari, laciniis linearibus angustissimis, medio longiore; calcare longo, ovario duplo æquante, clavato; columna brevi; antheræ apicibus tenuibus filiformibus; processubus stigmaticis crassiusculis porrectis brevioribus.

Madagascar, Imerina, *Deans Cowan* (icon.), *Lyall! Herb. Kew.*

This is a very singular plant, with a stout stem covered with sheathing-leaves, and terminated by a short loose spike of about five flowers. The dorsal sepal is lanceolate, with the edges inflected so as to be somewhat hooded. The petals are bifid, both the lobes are very narrow, and the lower one is much longer than the other and directed forward. The lateral sepals are oblong obcuneate, with the upper angle acute. The lip has a short oval-triangular base, and three long, very narrow lobes, the middle one of which is the longest. The spur is twice as long as the ovary, irregularly bent, and thickened at the apex. The whole flower is green, except the anther, which is cinnamon-coloured, and exhales a perfume of vanilla. The anther-lobes are slender, long, and straight; the stigmatic arms shorter, thick, and blunt.

The description is taken from the original specimen in Herb. Kew, and a very excellent drawing, with details, by Deans Cowan, in the British Museum Herbarium.

§ *Platanthera.*

H. DISOIDES, n. sp.; caule valido elato, dense foliato; foliis ovatis acuminatis; racemo densissimo multifloro; bracteis ovatis acuminatis, inferioribus flores superantibus; sepalo postico lanceolato obtuso, lateralibus oblongis lanceolatis obtusis; petalis subsimilibus subæqualibus; labello oblongo obtuso crenulato subintegro, in medio costato, marginibus apud basin reflexis; calcare quam ovarium breviore crassiusculo obtuso, apice bilobo; anthera lata obtusa, profunde fissa, apicibus brevissimis; processubus stigmaticis nullis.

Ankafana, *Deans Cowan*! *in Herb. Brit. Mus.*

A stout plant 8 inches to 27 in height, covered thickly with ovate acuminate leaves 1 to 2 inches long, and hardly ½ an inch across; the lower ones clasp the stem, the upper ones pass into almost lanceolate bracts. The raceme is 3 to 6 inches long, the flowers closely packed. The bracts in the lower part of the raceme are ½ an inch in length, overtopping the flowers. The petals and sepals form a galea, but are free; the lip is oblong, obscurely 3-lobed, crenulate, with a ridge running down the middle; the margins at the base are turned up so as to form a channel to the entrance to the spur. It is 3 lines by 1½ in diameter. The spur is short and thick, the end very shortly bifid.

CYNORCHIS, *Thouars* (Cynosorchis).

This genus seems quite natural if *Amphorchis*, Thouars, be dissociated from it. It may be divided into two sections—*Eucynorchides*, with large flowers with a 4-lobed lip and long spur; and *Parvifloræ*, with numerous small flowers, an almost entire lip, with small lateral lobes and a short blunt spur.

The genus appears to be exclusively Mascarene; besides the Madagascar species, there are two Bourbon species, *C. Arnottioides*, Reichb. f., and *parviflora*, Reichb. f., and one Mauritius one, *C. Boryana*, Lindley.

I append a synopsis of the genus.

EUCYNORCHIS. Flores sæpius speciosi, labellum 4-fidum, calcar longum.
Flores maximi, 1–2; labellum biunciale, latum; calcar apice incrassatum ...... *grandiflora*.
Flores mediocres; labellum unciale vel paullo minus .... *uniflora*.
Labellum ½ rarius ¾ uncia longa.
Flores plures congesti, folium 1, latum.
Flores 30–35, folium 16-unciale......... *calanthoides*.
Flores pauciores 10–20, folium vix pedale.
Sepalum posticum basi saccatum ... *gibbosa*.
Sepalum posticum ovatum, 1; petala angusta lanceolata .... *angustipetala*.
Labellum minus quam ½-unciale, folia 2 ... *fastigiata*.

Racemus elongatus ; flores sæpius pauci ;
  lobi medii labelli truncati divergentes ;
    scapus gracilis rectus .... *purpurascens.*
  lobi medii labelli, rotundati, approximati ;
    scapus flexuosus .... *flexuosa.*

PARVIFLORÆ. Labellum trilobum vel integrum, calcar brevi.
  Labellum trilobum, calcar clavatum ;
    lobi labelli subæquales truncati crenulati. *Boryana.*
    lobus labelli medius longior, porrectus integer .... *lilacina.*
  Labellum integrum vel subintegrum ;
    scapum hispidum .... *hispidula.*
    scapum glabrum ;
    racemus cylindricus ; calcar conicum ... (*Arnottioides.*)
    racemus laxus ; calcar cylindricum ;
      labellum lineare, curvum.................. *brevicornu.*
      labellum flabellatum .... (*parviflora.*)

§ *Encynorchis.*

CYNORCHIS UNIFLORA, *Lindley, Genera & Sp. Orch. Pl.* p. 331.

Speciosa, tuberibus oblongis obtusis lanatis ; foliis radicalibus linearibus lanceolatis acutis 5–8-uncialibus ; caule validulo, 8-unciali, pedali et ultra, vaginis caulinis 2, lanceolatis acuminatis ampliatis ; bracteis lanceolatis acuminatis ovarii dimidio vix æquantibus ; floribus magnis paucis 2–4, rarius singulo ; sepalis ovatis obtusiusculis viridibus : petalis lanceolatis viridibus ; labello magno plano 4-lobo, lobis obtusis latis vinaceo-purpureis ; calcare longo crassiusculo recto, apice incrassato, ovario subæquante ; processubus stigmaticis elongatis porrectis angustis.

Madagascar, *Lyall* ! *in Herb. Kew* ; *Hilsenberg & Bojer* ! Near water, in open country, no perfume, Ankafana, *Deans Cowan* ! *in Herb. Brit. Mus.*

The specimen which Lindley described has but one flower, whence the specific name ; but all the others that I have seen have had from two to four, usually the latter. The flowers are the largest in the genus next to *C. grandiflora*, Ridl., the lip being 1 inch in length, with a diameter in its broadest part of ½ an inch. The spur, as in others of the section, is straight and cylindrical, the last third being dilated ; it is from 1 to 1½ inch long, nearly equalling the ovary. The colours are taken from an excellent drawing made by the Rev. W. Deans Cowan.

CYNORCHIS GRANDIFLORA, *Ridley, Journ. Linn. Soc.* xx. p. 332, has been also collected by Baron in Central Madagascar, no. 133! *Herb. Kew.*

C. CALANTHOIDES, *Kranzlin, Verhandl. Bremen,* vii. p. 260.—C. gibbosa, *Ridley, l. c.* Is remarkable for being epiphytic; it was found at Alaki by Rutenberg, growing on a *Pandanus.*

C. FLEXUOSA, *Lindley, Gen. & Sp. Orch. Pl.* p. 331.

C. tuberibus oblongis lanatis; radicibus cylindricis pluribus elongatis; caule gracili sesquipedali, folio uno lineari longo, altero infra breviori vaginæformi; spica laxa flexuosa; floribus mediocribus; bracteis lanceolatis acuminatis ampliatis, ovarii dimidio æquantibus; sepalis ovatis lanceolatis obtusis, postico breviore, cum petalis lanceolatis subacutis connivente; labelli lobis lateralibus obovatis truncatis, medio cuneato emarginato; calcare recto cylindrico; columna brevi; processubus stigmaticis brevibus crassiusculis, medio longiore lanceolato obtuso, apice curvo.

Madagascar: Nosi-Komba in graminosis, fauce purpureo picturato, Dec. 1879, *Hildebrandt* no. 3257!; Imerina, floribus sulphureis medio purpureo, Jan. 1881, *Hildebrandt* no. 3837! no. 3838!; same locality, *Deans Cowan*!; no specific locality, *Hilsenberg & Bojer*! *in Herb. Brit. Mus.*; Itassi lacus, *Rutenberg fide Kranzlin, Verhandl. Bremen,* vii. p. 261; *Pervillé* no. 588! *Herb. Kew.*

C. ANGUSTIPETALA, n. sp.; folio radicali vaginante ovato-lanceolato acuto reticulato; caule validulo; floribus pluribus aggregatis; bracteis lanceolatis acuminatis ampliatis, quam ovarium multo brevioribus; sepalo postico ovato galeato, lateralibus ovatis latis; petalis lanceolatis, quam sepala brevioribus et multo angustioribus; labello 4-lobo, laciniis subæqualibus latis oblongis truncatis, margine crenulatis, pubescentibus, basi marginibus evectis ad processus adnatis: calcare filiformi acuto sexunciali; anthera carinata; processubus stigmaticis crassis obtusis rectis, medio lanceolato obtuso longiore evecto; ovario pedicellato.

Madagascar, *Hilsenberg & Bojer*! *in Herb. Brit. Mus.*

This plant is closely allied to *C. flexuosa*, Lindley, which it resembles in the form of its leaf and the shape of the stigmatic processes. It is distinguished by its broader lip with crenulate

margins and more oblong diverging lobes, by the very narrow petals, and the keeled anther. The flowers, too, are more numerous, and crowded into a loose head, like that of *C. calanthoides*, Kranz. The broad leaf and numerous flowers also distinguish it from *C. purpurascens*, Thouars. The stem is about 10 inches in height; the radical leaf 3 inches in length by ¾ in the broadest part. The bracts are ¾ of an inch, the ovary nearly 2 inches long, distinctly pedicellate. The lip is ¾ of an inch long, ½ an inch across the lower lobe. Its edges at the base are reflected and attached to the lower part of the stigmatic arms, thus forming a tube to the entrance of the straight spur, which is 1½ inch long.

CYNORCHIS PURPURASCENS, *Thouars, Orch. Iles Afr.* t. 15; *Lindley, Gen. & Sp. Orch. Pl.* p. 331; *S. Moore, in Flora Maur. et Seych.* p. 337.—Gymnadenia purpurascens, *Rich. Orch. Maur.* p. 29, t. 6. f. 1; *Bojer, Hort. Maur.* p. 311.

C. foliis radicalibus 2 longis lanceolatis acutis, basi angustatis; caulino singulo longo lanceolato acuminato, caule gracili paucifloro; floribus mediocribus roseis, raro albis, bracteis lanceolatis acuminatis ampliatis; sepalis ovatis obtusis, petalis ovatis lanceolatis obtusis subæqualibus angustioribus; labello quadrilobo pubescente, lobis oblongis truncatis subæqualibus; calcare filiformi, ovario subæquante; ovario longo gracili fusiformi.

Madagascar: Nosi-Komba, N.W. Madagascar, Feb. 1880, *Hildebrandt* no. 3349!; Antananarivo, *Rutenberg*; *Lyall*! *Herb. Kew*; *Thouars*. It also occurs in Bourbon and Mauritius.

C. FASTIGIATA, *Thouars, Orch. Iles Afriq.* t. 13; *Lindley, Gen. & Sp. Orch. Pl.* p. 332; *Bot. Reg.* t. 1998; *S. Moore, in Flor. Maur. et Seych.* p. 337.—Gymnadenia fastigiata, *Rich. Orch. Maur.* p. 25; *Boj. Hort. Maur.* p. 310.

Madagascar, *Baron*, 204! 492! *Herb. Kew.* Mauritius, *Thouars*! *Sieber Fl. Maur.* ii. p. 169! *Capt. Carmichael*! *in Herb. Brit. Mus.* Pamplemousses, *Gardner*! *Ayres*! *Bouton*! *Bojer*! *Herb. Kew.* Seychelles, Mahé, *Horne*!; Praslin, *Delisle*!

§ *Parvifloræ.*

C. LILACINA, n. sp.; folio radicali singulo lanceolato acuto flaccido; caule pedali debili, vaginis remotis 2–3, lanceolatis acuminatis; floribus parvis pluribus; bracteis lanceolatis acuminatis brevibus; sepalo postico ovato cucullato, apice reflexo, cum petalis ovatis lanceolatis connivente; sepalis lateralibus ob-

longis ovatis, majoribus obtusis patentibus; labello trilobo, lobo medio longiore lanceolato obtuso, lateralibus brevibus ovatis obtusis reflexis; calcare brevi, basi infundibuliformi, apice clavato; antheræ loculis angustis, apicibus longis planis ad rostellum adnatis; processubus stigmaticis angustis, apicibus obtusis curvis; polliniorum caudiculis longis validulis, glandula ovata; ovario longe-pedicellato hirsuto.

Madagascar: Ankafana, *Deans Cowan*! *in Herb. Brit. Mus.*, *Baron* no. 229! *Lyall*! *in Herb. Kew.*

This plant has more of the habit of a *Habenaria* than that of a *Cynorchis*; nevertheless the structure of the anther and rostellum shows that its affinity is with the latter genus. It is a weak-looking plant, with one or two lanceolate radical leaves, and a short raceme of a few lilac flowers.

[Cynorchis Boryana, *Lindley, Gen. & Sp. Orch. Pl.* p. 331; *S. Moore, in Flor. Maur. and Seych.* p. 337.—Gymnadenia Boryana, *Rich. Orch. Maur.* p. 28, t. 5; *Bojer, Hort. Maur.* p. 311. Appears to have been only once collected, viz. by Bory in Mauritius.]

Cynorchis brevicornu, n. sp.—Pedalis, foliis 3 lineari-lanceolatis acuminatis erectis; racemo multifloro laxo; floribus minimis; bracteis linearibus acuminatis; sepalo postico obtuso cucullato quam petala falcata obtusa paullo breviore; lateralibus ovatis obtusis obliquis; labello lineari angustato, apice recurvo; calcare brevi obtuso cylindrico, ovarii trienti æquante, apicibus antheræ rectis planis; processubus stigmaticis angustis oblongis; polliniis minimis, caudiculis capillaceis; glandulis ovatis minutis.

Ankafana, *Deans Cowan*! *in Herb. Brit. Mus.*

This species, together with *C. hispidula* and probably also *C. Arnottioides*, Reichb. f., a native of Bourbon, which I have not seen, form a group distinguished from the rest of the genera by the small and usually numerous flowers, the narrow upcurved, almost if not quite entire lip, the short blunt spur, and erect, not spreading, lateral sepals. The cylindrical raceme and very small spur distinguish *C. Arnottioides*, Reichb. f., while *C. hispidula* differs in its smaller size and hispid stem.

C. brevicornu has a slender stem, from 9 inches to a foot in height, with one or two linear-acuminate bract-like stem-leaves, and 2–3 linear-lanceolate radical leaves 3 to 4 inches long and ½ an inch in diameter. The bracts are linear-acuminate, 2 lines in length; the spur 2 lines; the ovary 6 lines.

CYNORCHIS HISPIDULA, n. sp.—Pusilla; tuberibus oblongis semiuncialibus; foliis radicalibus lanceolatis acutis erectis glabris, trienti caulis æquantibus; caulinis 1–2 parvis linearibus acuminatis; caule gracili hispido; floribus minimis paucis, paullo dissitis; bracteis dimidio ovarii æquantibus; sepalo postico ovato cucullato, lateralibus lanceolatis obtusis; petalis falcatulis obtusis ovatis; labello brevi recurvo angusto oblongo-obtuso trilobo, lobis lateralibus obtusis quam medius multo brevioribus; calcare quam ovarium dimidio breviore, cylindrico obtuso; columna brevissima, apicibus antheræ elongatis recurvis; rostello plano breviore obtuso; processubus stigmaticis quam antheræ apicibus breviore subcylindricis obtusis; caudiculis polliniorum longis, glandulis rotundatis.

Ankafana, Imerina, *Deans Cowan*! In paludibus Ankafana, *Hildebrandt* no. 3981, *in Herb. Brit. Mus.*

This little plant is about 4 inches in height, with one or two rather large woolly tubers ½ an inch long. The leaves, about four in number, are acutely lanceolate, 1 inch in length. The raceme contains about seven very small flowers. The apices of the anther are curved up at the ends, and on either side there is a small triangular flap attached to the column, which rises above them and flanks the entrance to the spur. The stigmatic lobes run parallel to the anther-points beneath them, but are shorter, straight, and knobbed at the end. The rostellum is of the usual shape, but is but slightly raised in the middle.

AMPHORCHIS, *Thouars.*

This genus was based by Thouars on *A. calcarata* and *inermis.* The latter species was transferred to *Arnottia* by Moore, the former by Lindley to *Cynorchis.* Blume, Mus. Bot. Lugd. Bat. ii. p. 190, separated it again, and restored the genus, adding another species to it. The authors of the 'Genera Plantarum' again restored it to *Cynorchis.* It seems, however, quite distinct, and more nearly allied to *Arnottia* than to *Cynorchis.* The short rostellar lobes and numerous small flowers reversed are the distinguishing characters.

Besides the Madagascar species, *A. calcarata*, Thouars, and *A. lilacina*, n. sp., the genus contains *A. occidentalis*, Lindley, a remarkable orange-flowered plant from West Africa, and *A. laxiflora*, Blume, a native of Bourbon.

AMPHORCHIS CALCARATA, *Thouars, Orch. Iles Afriq.* t. 4; *Blume, Mus. Lugd. Bat.* ii. p. 190; *S. Moore in Flor. Maur. & Seych.* p. 338.

Subpedalis; folio radicali ovato petiolato vel lanceolato-acuto; caulinis 4 lanceolatis acuminatis; scapo gracili; floribus pluribus parvis aggregatis reversis; bracteis lanceolatis acuminatis; pedicellis ovariis æquantibus; sepalis ovatis obtusis, lateralibus quam posticum et petala longioribus; petalis oblongis lanceolatis obtusis, quam sepala angustioribus; labello late obcuneato crenulato trilobo, lobis lateralibus sæpe vix distinctis; calcare filiformi, ovarii dimidio æquante, apice obtuso, rarius dilatato uncato; apicibus antheræ brevibus obtusis; polliniis pyriformibus; ovario hispido.

Madagascar: Imerina, *Deans Cowan*! Andrangoloaka, *Parker*! *Herb. Kew.* Bourbon, *Thouars*! Mauritius, *Captain Carmichael*! *Gen. Hardwicke in Herb. Brit. Mus.*

This plant appears to vary in several respects. The leaf in the Madagascar specimen is ovate and petiolate, while in a specimen from Mauritius it is lanceolate, with a lamina 1½ inch long by ½ an inch. The lip, too, varies in shape, sometimes distinctly narrowed at base, sometimes hardly so; often the lateral lobes are hardly to be traced; some specimens have a distinct but small cusp at the apex. The spur is either short, cylindrical, and blunt, or slender, with the apex slightly dilated and hooked. The rhachis of the spike is usually very pubescent. The stem varies from 7 inches to 1 foot in height.

A. LILACINA, n. sp.; foliis radicalibus ovatis petiolatis cuspidatis, caulinis acuminatis; scapo gracili subpedali; racemo laxiusculo; rhachide hispida; floribus circiter 12 parvis reversis lilacinis, minute pubescentibus; bracteis lanceolatis longe acuminatis, dimidio ovarii æquantibus; sepalo postico ovato obtuso, lateralibus latioribus patentibus; petalis lanceolatis acutiusculis; labello obcuneato emarginato crenulato, purpureo-maculato; lobis lateralibus brevissimis obtusis erectis; calcare recto filiformi attenuato, apice uncato, dimidio ovarii æquante; antheræ apicibus brevibus crassiusculis; rostello subsimili subæquali; processubus stigmaticis brevibus clavatis, supra apices antheræ laciniis triangularibus parvis extus munitis; glandula elongata lanceolata acuminata; polliniis nigris; ovario hispido.

East Imerina, Ankerimadinka in sylvis primævis, flores lilacini, Oct. 1880, *Hildebrandt* no. 3730! *in Herb. Brit. Mus.*

This plant is nearly allied to *A. calcarata*, Thouars. It has a few ovate leaves with rather long petioles, 4 inches in length by nearly 1 in breadth. The scape is from 8 to 9 inches in length, and is glabrous in its lower part; but the rhachis of the spike is hispid. The flowers are small, entirely but very minutely pubescent, lilac; the lip is spotted, apparently with darker purple, and has several raised lines on the middle lobe. The petals and sepals are flat and spreading. The spur is straight, parallel with the ovary, and about half its length, slender, gradually tapering away to the point, which ends in a small hook. The anther-lobes are rather short and almost straight, so that they project over the entrance to the spur; between them lies the rostellum, which is also straight, and of just the same length. The stigmatic arms are short and knobbed; they project almost at right angles to the anther-lobe, and are, when the column is placed in the usual position of an orchid flower (*i. e.* with the lip downwards), above and to the side of the apices of the anther. This is an interesting adaptation to suit the position of the flower. In most cases where the lip is uppermost, the point of attraction is not at the base of the labellum, but at the base of the posticous sepal, which develops a spur and functions as a lip, as in *Disa*. Here, however, a different plan is pursued. An insect alighting on the vertical lip, would push its proboscis into the spur, and in withdrawing it would remove the pollinia. These, instead of falling forward towards the lip, would, from their weight and position, fall in the opposite direction, which would bring them to a position above the apices of the anther, in which position we find the stigmatic arms. As, however, the arms are outside the anther, there must also be a divergence of the caudicles, as there is in so many of the *Habenariæ*. The caudicles are rather long, the gland narrow and pointed, the pollinia black.

SATYRIUM.

The head-quarters of this genus is at the Cape. It is found also in Tropical Africa and India. All the Madagascar species are endemic.

S. TRINERVE, *Lindley, Gen. & Sp. Orch. Pl.* p. 344.

On dry grassy plains, Ankafana, Imerina, *Deans Cowan*!; in pratis siccis, Jan. 1881, no. 3872 *Hildebrandt*! *in Herb. Brit.*

Mus.; Ambatomainty, 1 Dec. 1877, Antananarivo, 1884, *Rutenberg.*

This species is undoubtedly near *S. rostratum*, of which it has quite the habit; but the bisaccate blunt spur much shorter than the ovary, and the deflexed petals and sepals quite distinctly separate it. The stem is from 15 to 18 inches tall, and the radical leaves are as much as 6 inches long.

SATYRIUM ROSTRATUM, *Lindley, Gen. & Sp. Orch. Pl.* p. 338.

Madagascar: Ankafana, *Deans Cowan*! Rasamoala, "perfumed, grows on grassy plains, Feb. 1880," *in Herb. Brit. Mus.*; no. loc., *Lyall, Herb. Kew.*

This plant grows to nearly a foot and a half high; it has about two flaccid, green, lanceolate, blunt, 7-nerved, radical leaves, and a number of narrower erect, clasping stem-leaves. The radical leaves are 5 inches long and 1 across. The flower-spike is rather compact, more lax than trinerve, an elongate cone in shape. The bracts are at first erect, after flowering deflexed; they are lanceolate-acuminate, ½ an inch long. The flowers are small and white. The ovary being untwisted, the lip is, as usual in the genus, uppermost. The two spurs are slender, filiform, and curved, ½ an inch long. The column is almost straight, long, and slender. The pollinia oval, with rather a long caudicle and circular gland. The various segments of the perianth are connate into a short but distinct tube.

S. GRACILE, *Lindley, Gen. & Sp. Orch. Pl.* p. 338.

Madagascar, *Lyall*! 314, 315; *Baron*! *Herb. Kew.*; Ankafana, Imerina, *Deans Cowan*!

This plant is very nearly allied to *S. rostratum*, Lindl., but differs in its broader radical leaves, few, shortly sheathing, very remote stem-leaves, only 1 inch in length, its much more lax spike and longer spurs, 8 lines in length. The stem is from 1 foot to 1½ in height. The bracts, which are at first erect but reflexed after flowering as in the other species, are ½ an inch long.

S. CALCEATUM, n. sp.—*S.* foliis lanceolatis acuminatis ensiformibus strictis, vaginantibus pluribus; caule erecto validulo; racemo laxo plurifloro; bracteis semper erectis, floribus subæquantibus, ovatis lanceolatis acuminatis; sepalis lateralibus oblongis obtusissimis carnosis, marginibus valde inflexis, apice carinatis, postico quam laterale paullo breviore, clavato gracili; petalis quam sepala brevioribus ovatis obtusis; labello oblongo obtusissimo calceiformi carnoso; calcare quam ovarium multo breviore, crasso obtuso bisaccato; columna brevissima; anthera angusta; stigmate oblongo lato.

Madagascar: N. Betsileo in paludibus, Jan. 1881, *Hildebrandt* no. 3845! *in Herb. Brit. Mus.*

This is a very striking plant, with a stiff stem 20 inches in height, covered loosely with a number of narrow acuminate ensiform leaves all similar, the lower ones 2 inches in length. The spike of rather small fleshy flowers is 6 inches long, quite lax; the bracts are always erect, ovate-lanceolate, ¾ inch long. The dorsal sepal is club-shaped, narrow at the base and almost cylindrical, but dilating into a grooved knob at the end. The lateral sepals are broader, oblong, and fleshy, with a faint keel running up into a short, blunt, conical process at the apex, and the margins so much reflexed on the underside as almost to meet. The petals are thinner in texture and much shorter than the sepals, ovate; they are quite concealed by the sepal. The lip is oblong, about as long as the sepals, very blunt, and the edges curved up so as to resemble a shoe; the spur is short and thick, 2 lines long, only obscurely bisaccate at apex. The column is unusually short and thick, the anther rather narrow, and pollinia somewhat laterally flattened. The ovary is glabrous, 6 lines long.

DISA.

DISA INCARNATA, *Lindley, Gen. & Sp. Orch. Pl.* p. 348; *Kranzlin, Verhand. Bremen*, vol. vii. p. 263.

Imerina, *Deans Cowan*!; Central Madagascar, *Baron*! *in Herb. Brit. Mus.*; Antananarivo, *Rutenberg*.

D. RUTENBERGIANA, *Kranzlin, Verhand. Bremen*, vii. p. 262—Antananarivo, *Rutenberg*—I have not seen.

PLATYCORYNE.

An endemic genus.

P. PERVILLEI, *Reichenbach fil. in Bonplandia*, 1855, p. 212.

Ambongo, *Pervillé*! no. 593 *in Herb. Kew*.

This plant has a rather slender stem 2 feet in height, with about 7 scattered narrow acute leaves on the stem, an inch in length, and a small rather lax raceme of about 6 flowers. The bracts are loose and almost hooded, ½ an inch long, a little shorter than the ovary. The dorsal sepal is 3 lines long.

DISPERIS, *Swartz*.

All the species of this genus found in the African islands belong to the section *Dryopeia*, characterized by its few ovate or cordate amplexicaul leaves. The plants of this section are distributed over Eastern Tropical Africa, from Abyssinia to Natal, and occur also in Southern India.

Only two species have as yet been recorded from Madagascar, *D. oppositifolia*, Lindl., with small flowers and a pair of opposite leaves, and *D. Hildebrandtii*, Reichb. f., with a single leaf and larger flowers.

D. OPPOSITIFOLIA, *Smith in Rees's Encycl.*; *Lindley, Gen. & Sp. Orch. Pl.* p. 371; *S. Moore in Flor. Maur. et Seych.* p. 331.—Dryopeia oppositifolia, *Thouars, Orch. Iles Afr.* t. 1; *A. Rich. Orch. Maur.* p. 35.

Madagascar, *Thouars, l. c.*; on the ground, Ankafana, no perfume, *Deans Cowan* (icon.). Mauritius, *Capt. Carmichael*! *Commerson*! Ins. Mascarene, no locality, *Thouars*! *Macgregor*! *in Herb. Brit. Mus.*

This is a smaller-flowered plant than *D. Hildebrandtii*; it attains the height of 6 or 8 inches. The pair of stem-leaves are nearly opposite, ovate-lanceolate, or nearly ovate, 1 inch to 1½ long, ½ in diameter. The capsule is narrow and elliptical, with rather a long beak; it is ¾ inch long.

D. HILDEBRANDTII, *Reichenbach, Otia Hamburg.* ii. p. 73.

Nossibé, Lokobé, *Hildebrandt* no. 3158! *in Herb. Brit. Mus.*

The whole plant is 4–5 inches tall, with the leaf ¾ inch in length.

DESCRIPTION OF PLATE XV.

A. *Bicornella gracilis*, Lindley.

Fig. 1. A whole plant, nat. size.
2. Flower enlarged.
3. Flower enlarged, petals and sepals removed.
4. A pollinium, enlarged.

B. *Bicornella parviflora*, Ridley.

Fig. 5. A whole plant, nat. size.
6. Flower enlarged.
7. Flower enlarged, petals and sepals removed.
8. Column and lip from in front, enlarged.
9. A pollinium, enlarged.

The Coast Flora of Japygia, S. Italy.

By HENRY GROVES, F.L.S.

[Read 2nd April, 1885.]

ONE of the least-visited parts of Southern Italy is that corner now known as the Province of Lecce, formerly as the Terra d' Otranto, and anciently as Japygia. My observations in this paper will be confined to the coast-line of the district situate between Otranto and Taranto, extending sometimes to a few miles inland. Its area presents a great variety of soil and level, which renders it especially interesting to the botanical explorer, who now has to wade through extensive marshes, now through deep sands, or stand enchanted on some noble headland, which, like the Capo di Leuca, must have caught the eye of many a Greek emigrant bound for the Magna Grecia, that promised land towards the setting-sun—that sun which in these regions sets so frequently with a weird mysterious light which cannot fail to fill the mind with awe and speculation, and compel one to feel but a pygmy pilgrim halting on the threshold of the great unknown!

Glancing at the map of Italy, we find that, after the basin of the Po, the Terra d' Otranto contains the greatest extent of territory void of mountains in the whole peninsula. Although its surface is frequently undulating, the swelling ground never acquires sufficient height to exercise a marked influence on the temperature of the plains, which are unvisited by the cool breezes of mountainous countries. For this reason the plains partake of the climate of the opposite coasts, where the immediate presence of high mountains shelters the shores at their feet, the cold blasts from their summits passing harmlessly seaward. We thus find that the coast-lines on either side of the straits are under somewhat similar climatic conditions, although from opposite causes, one being from the absence of mountains, and the other from their immediate presence. Moreover, both are subjected to the same powerful sun in summer and to about the same rainfall in winter.

When we reflect on the great commerce in grain and other produce which must have flowed from the Mother Greece to her Italian colonies, whose shores are washed by the same seas, and on the annual migration of birds, which is so fruitful a source of seed-distribution, we become surprised, in glancing through the Italian floras, to observe that so few Eastern or Greek plants are recorded in the south-east of the Italian peninsula.

It was this reflection, stimulated by a visit made to some relatives in the district, that led me to take a great interest in its flora. Since then I have been able to add about a dozen Greek or Eastern species to the Italian lists. And who knows how many others are yet to be found by local botanists, if such exist! At all events they would not have to travel thirty-six hours, as I have to do from Florence, before arriving on the happy hunting-grounds. Yet until such botanists do appear, my friends must be content with such meagre fare as I can provide for them; and bewail the fact that at present no one is to be found to tread in the steps of Marinosci, who seems to have explored the Province of Lecce more completely than Gussone or Tenori. An analysis of the flora of the district, based on my present knowledge of it, will, I hope, prove acceptable to those who have not had the opportunity of observing the vegetable products of this corner of Italy. With this idea I have gone through the list I intend publishing *in extenso* at no distant date, in order that I might set forth its more salient features and note its more interesting species, in the form of the present paper.

If we examine the distribution of plants in the South of Europe, we shall find that it consists of several groups formed by a variety of influences, such as diversity of soil and position, modified frequently by intervening seas or mountains. There is one group, which we may call the GENERAL MEDITERRANEAN FLORA, whose members occupy the coasts and adjacent parts of the whole continent, extending from Spain through France and Italy to Greece, where, however, they become crowded out by a more Eastern flora, and are, moreover, checked by the strong currents of the Adriatic Sea. A second and more interesting group consists of species that are not found in the South of France nor on the Riviera and central parts of Italy, and which seems to occupy a territory south of 41 degrees. This zone embraces Sicily and the southern parts of Italy, with Spain and the Balearic Isles, as well as Greece; and may be styled the SOUTH MEDITERRANEAN FLORA. But there are some plants in this belt which have a limited extension longitudinally; and for the sake of bringing their limited distribution into relief, I have thought it profitable to divide them into different groups, which will be described hereafter under their respective heads.

Amongst the members of the General Mediterranean Flora there are many very rare species; but their number and wider distribution preclude them from a fair notice in this short paper; so I shall proceed to describe their economical uses and varieties rather than select any for their mere rarity. First of all I will mention the peculiarity of habitat exhibited by *Alyssum montanum*, L., and *Allium tenuifolium*, Ten., both of which are to be found on spots close by the sea and almost on a level with it; whereas they are found usually at a greater or less height on the Apennines or their spurs. The first-named is found at San Pietro in Bevagna, while the latter grows by the Montagna Spaccata, a maritime rock on the coast near Gallipoli. There also a curious form of *Umbilicus horizontalis*, DC., is found, having each of its flowers supplanted by a spike placed horizontally. In the pastures near Otranto the abundance of *Trigonella corniculata*, L., and *T. monspeliaca*, L., which are called locally by the name of "forficicci," from the fancied resemblance of their fruit to a pair of scissors, are found very inconvenient, inasmuch as they communicate a very nauseous flavour to the flesh of beasts, and even birds, who feed on them. One must have frequently observed that the peculiar odour of the Trigonellas remains in the herbarium for a great many years, probably as long as the plant is intact. A curious variety of *Teucrium Polium*, L., is found on the coasts of Gallipoli and Otranto, the plants being procumbent and rooting, and the flowering heads show a tendency to turn yellow when mature. In the same places *Sideritis romana*, L., has its whorls of flowers so closely placed as to resemble *S. approximata*, Guss., which one finds in Sicily, and which I believe to be only a variety of the first-named. In the sands about Gallipoli *Plantago albicans*, L., is remarkable for the large cottony processes at the end of the spikes, which are almost invariably disfigured by this development. In the same sands the vine is found to thrive very well; and large spreading fig-trees grow where one would only look for *Ammophila*.

This curious state of things is attributed to the quantity of calcareous matter, whether the produce of shells or not, which is found in the sand-hills. Not only in reclaimed marshes, but in old arable land, the planting of vines is becoming universal, the dwarf procumbent vines yielding a wine which contains from 15 to 18 per cent. of alcohol, thus rendering it capable of transport by sea. Two French firms have erected establishments where the different wines of the Province are blended so as to found a type, the want of which has always militated against the introduction of Italian wines in the European market. In the large marsh near the town one meets with *Alisma ranunculoides*, L., which bears from two to three whorls or umbels, thus differing very decidedly from our smaller specimens in the north.

Walking along the sandy shores of Italy, one cannot fail to observe the number of felt balls of a light-brown colour scattered or heaped about those parts removed from the influence of the waves. These are produced by the action of the waves and wind on the fibres of the *Posidonia caulinia*, Kœn., which are so plentifully strewn on the coast after a gale. On account of the nature of the fibre, they have a tendency to agglomerate round some nucleus, until finally they form a natural felt, which, by constant rolling, either by the waves or wind, assumes a spherical shape; and although one observes sometimes other forms more or less elliptic, the far greater number are round, and would be speedily utilized as playballs by British children if perchance they were to be found on their coasts.

One of the most widely distributed plants in the Terra d' Otranto is the medicinal squill, which abounds from the coast-line to a distance of ten or fifteen miles inland; and in some parts during summer the leafless spikes are so numerous that, when young, one can imagine oneself in a vast Asparagus-bed. The bulbs, when confined between rocks, which are plentiful enough in these bushy plains, assume all kinds of polygonal forms, reminding one of coarse tessellated pavement, this being brought about by mutual pressure exerted during growth in a confined space. At Otranto, where the tendency of the people is to consume vegetable food, the leaves and roots of chicory being a staple product, the bulbs of *Bellevallia comosa*, Kunth, are eaten in different ways as a salad, for which purpose they hardly seem suitable on account of their being so gelatinous; but the natives of Japygia are enterprising, and some of the poorer classes flavour their meal of bread by using the leaves of *Helosciadum nodiflorum*, L., which are reputed poisonous by most people. In the same way several species of poisonous Fungi are used as articles of food by the natives of Tosi in Tuscany; but in this case not before repeated maceration in strong brine, which has the effect of destroying the poisonous principle. At Taranto and Gallipoli *Juncus acutus*, L., is used for manufacturing the large conical cages or fish-pots; some of them are 6 feet in height, and used by the fishermen of the Japygian coasts for the capture of several species of the finny tribe. Two stems, bound together by twine, are used for the bars of the pot, while hoops of the same material serve to strengthen the structure, which is capable of much wear and tear, as it is frequently sunk in tideways, that must try its solidity not a little. What English botanist, floundering about in a bog in quest of a specimen of *Schœnus nigricans*, would ever dream that the plant could be utilized for the manufacture of rope? Yet such is the case; the primary material being very abundant on the sea-coast, especially in marshy places, where its growth is more luxuriant; although one is surprised to observe the species all round the Italian shores in spots with no unusual moisture. It is gathered by pulling the stem from its sheath, never by cutting; and, after drying, is subjected before use to soaking in water. Afterwards the stems are beaten with some blunt implement and become pliable and fit for manipulation, the strands being twisted together by the fishermen in leisure moments. Ropes of all thicknesses are made, and have the credit of being more durable than hempen ones when constantly immersed in water; for this reason they are employed for lowering well-buckets as well as for mooring the fish-pots we have already described.

Eleocharis ovata, R. Br., from the shores of the Alimini lakes near Otranto, has very black and shining seeds instead of the usual brown ones, a character which has been observed elsewhere, although not noticed in text-books, I believe. With this we will conclude our remarks on the peculiarities and uses of some members of the general flora, and pass on to the enumeration of some good species belonging to the SOUTHERN MEDITERRANEAN FLORA, which are met with, though rarely, throughout its whole longitudinal extension.

Clematis cirrhosa, L., var. *balearica*, Rich., finds its eastern limit in our district, after passing through the Italian islands.

Fumaria agraria, Lag., a species first observed in the Iberian peninsula, but since found in Italy. Our plants from Gallipoli agree exactly with Spanish specimens I have in my herbarium.

Sinapis dissecta, Lag. | *Helianthemum glaucum*, Boiss.

Helianthemum leptophyllum, Dun.—This species was found at Leucaspide, near Taranto, by Mr. C. C. Lacaita, and having been forwarded to Willkomm, was recognized by him as one of the species described in his 'Icones Plantarum,' p. 128, and figured in plate 150 of the same work. Our plant differs only from the Spanish one by having somewhat smaller flowers. The variety *psilosepalum*, Willk., is also found with the species. According to Visiani, this plant is identical with *H. angustifolium*, Pers., that is to say, a variety of *H. vulgare*, Gaert.

Melandryum macrocarpum, Willk. | *Umbilicus horizontalis*, DC.
Kundmannia Sicula, DC.

Hippomarathrum Bocconi, Boiss.—I observed at Gallipoli a plant of this species which measured 5½ feet in height by 4 feet in breadth; and this giant was surrounded by three or four others of hardly less dimensions. At Otranto, below the Torre del Giardino, there is quite a coppice of them; and although of smaller dimensions than those of Gallipoli, they certainly produce a feeling of admiration for their sturdy forms. The stem and leaves yield a straw-coloured friable gum-resin, possessing a faint taste resembling the odour of the plant, which is not unlike Parsley. I feel certain that a large yield of resin would ensue from punctures made in the stout stems and branches.

Lagoecia cuminoides, L.—A species only recently added to the Italian floras as having been found by me; whereas Marinosci noticed it sixty years ago near Gallipoli, until which time it was supposed to jump from Spain to Greece. I have never found it in Marinosci's habitat; but it is not uncommon at Leucaspide in bushy places.

Pinardia Coronaria, Less.
Centaurea deusta, Ten.
Cichorium spinosum, L.
Notobasis syriaca, Cass.
Hypochœris neapolitana, DC.

Ipomea sagittata, Desf., which elegant species has been only latterly observed in our district. In the great marsh at Gallipoli its delicate stems twine round the stalks of *Carex hispida* and *Juncus multiflorus*, which forms the gross herbage of that locality. Mr. C. C. Lacaita has it from the Taranto coast.

Mandragora autumnalis, Spreng.
Verbascum macrurum, Ten.
Solanum sodomæum, L.
Micromeria nervosa, Benth.

Thymus capitatus, Hoffm. & Link.—It is somewhat remarkable that the fuel used at Otranto is supplied by three Labiates, one of which is the species under notice, perhaps the most abundant; while the other two are Rosemary and *Phlomis fruticosa*, which forms enormous bushes, if we may so apply the term to a herbaceous plant.

Halopeplis amplexicaulis, Ung. Sternb.—Is only found in the salt-marsh known as the "Salina grande," about three miles from Taranto, where it occurs in the inundated or sandy parts. Our plants are much less robust than those of Sicily. Some seed produced thriving plants on my terrace for two or three years in succession.

Emex spinosa, Campd.
Triglochin laxiflorum, Guss.
Ophrys Speculum, Link.
Botryanthus commutatus, Kunth.
Carex serrulata, Biv.

Rumex thyrsoides, Desf.
Orchis longicruris, Link.
Narcissus serotinus, L.
Dracunculus vulgaris, Sch. Bip.

Notholæna vellea, Desf.—This interesting Fern has its station on the rocks of the Serra towards the Montagna Spaccata, near Gallipoli, which is the only one in peninsular Italy. In Sicily it affects volcanic formations, in the same way as its relative the *N. Marantæ* shows a partiality to serpentine. Here, however, the habitat is of a calcareous nature, similar to those in Greece, where the plant is not so rare. Its local name is "Spaccapietra;" and it is said to be used to procure abortion.

We now come to a group containing species which occupy the same meridional belt, but do not extend further west than the Italian islands, a few species extending northward to the Dalmatian coast. To this we will give the name of the ITALO-GRECIAN FLORA; and in it we find:—

Berteroa obliqua, DC.
Ononis Sieberi, Bess.

Anthyllis Hermanniæ, L.—This rare species is little honoured in its own country, as it is used as a broom for sweeping the streets of Gallipoli, being brought from a point east of the town, where it is found to grow more luxuriantly than on the western rocks. It is at the best but a stunted bush, and not in the least flexible; but its branches are so wiry and interlaced that it is found to be a fair substitute for the *Erica Scoparia*, which is used in other parts of Italy. It has the merit of durability, which must have been its recommendation, as there is plenty of the rare *Erica verticillata*, Forsk., in the neighbourhood, which one would have thought better adapted to such uses.

Trifolium dalmaticum, Vis.
Elæoselinum Asclepium, Bert.

Valerianella Vesicaria, Mönch.
Leontodon fasciculatus, Nym.

Convolvulus tenuissimus, Sibth. & Sm.
Linaria reflexa, Desf.
Salvia triloba, L.
Anthemis peregrina, L.
Ervum agrigentinum, Guss.
Thapsia garganica, L.
Scorzonera Columnæ, Guss.
Metabasis cretensis, DC.
Scrophularia bicolor, Sibth. & Sm.
Linaria Sieberi, Reichb.
Phlomis fruticosa, L.

Phlomis ferruginea, Ten., according to my judgment, is but a variety of *P. fruticosa*, L., developed under the influence of salt-breezes on exposed parts of the country. It has been urged that the species described in Boissier's 'Flora Orientalis' under this name must differ essentially from *P. fruticosa*; but we must not forget that Tenori described his plant from Italian specimens; so if the Greek one differs from that of Italy, it ought to bear another name. Orphanides, however, who was acquainted with the Greek species, held the same opinion as I do, and believed the plant under discussion to be a variety of *P. fruticosa*, L.

Micromeria approximata, Reichb.
Rumex tuberosus, L.
Gagea foliosa, Schult.
Ornithogalum collinum, Guss.
Thymus striatus, Vahl.
Aristolochia altissima, Desf.
Avena condensata, Link.

We now come to some species found in the Terra d' Otranto and in Sicily, which form a small group of interesting plants spread over a very limited geographical area. Some of its members are found also in the adjoining Calabria. This division we shall call the Siculo-Japygian Flora. Amongst them we find:—

Sinapis pubescens, L.
Helianthemum sessiliflorum, Pers.
Medicago Echinus, DC.
Vicia sativa, var. *Cosentini*, Guss.
Brassica incana, Ten.
Dianthus rupicola, Biv.
Arthrolobium repandum, DC.
Eryngium Barrelieri, Bois.
Scabiosa ucranica, var. *eburnea*, Sibth. & Sm.

Scabiosa maritima, L., var. *villosa*, Coss., =*S. grandiflora*, var. *canescens*, Guss., develops into a most remarkable plant in the neighbourhood of Otranto, where, on the borders of fields and by way-sides, it is often found with twenty stems more than a yard high!

Calendula fulgida, Raf.
Urtica neglecta, Guss.
Ophrys exaltata, Ten.
Micromeria canescens, Benth.
Quercus pseudococcifera, Desf.
Gagea Granatelli, Parl.
Colchicum Bertolonii, Stev., var. *Cupani*, Guss.

We will now review the Græco-Japygian Flora, which, with the purely local plants of the section coming hereafter, will be found to contain the most noteworthy species of the whole enumeration; and ought to be much further enriched by diligent research, when we bear in mind what rich stores of species are found on the opposite coasts of Albania and Greece.

Ranunculus asiaticus, L.—This thoroughly Eastern species occurs on rough ground to the west of Otranto, and is now threatened with destruction through the cultivation of its habitat. Our plant is the red-flowered variety, and reaches here its most westerly European station.

Batrachium confusum, F. Schz., var. *heterophylla limosa*, which occurs also in Dalmatia.

Onobrychis echinata, Dietr.,=*O. alba*, Ten., is a plant which has been confounded with *O. alba*, Desv., which is found on some of the higher Apennines.

Carum multiflorum, Boiss., known also as *Athamanta multiflora*, Sibth. & Sm., and *Ligusticum græcum*, DC., is a remarkable plant, which seems rare everywhere, and of which no specimen exists at Kew, I believe. It resembles a *Ligusticum* in a most astonishing way; so much so, that without ripe fruit one would have no hesitation in placing it in that genus. It is one of the "finds" on the rocky ground north-west of Gallipoli, where so many good species keep themselves company.

Callistemma brachiatum, Boiss. *Idem*, var. *Sibthorpiana*, Boiss.

Anthemis brachycentros, Gay. Near Otranto this plant takes the place of *A. Cota* in the cultivated fields, and is a variety of the original Dalmatian species, having the receptacle chaff almost without a mucro.

Anthemis Chia, L.
Crepis rubra, L.
Leontodon asper, Poir.
Phyteuma limoniifolium, Sibth. & Sm.
Cardopatium corymbosum, Pers.
Lagoseris bifida, Koch.
Leontodon saxatilis, Reichb.
Erica verticillata, Forsk.

Scrophularia lucida, L.—This is the true Linnean species such as occurs in Greece, and not to be confounded with that of French authors. It is very abundant on the Serra and Montagna Spaccata near Gallipoli; and the variety *filicifolia* is also found with the species.

Acanthus spinosissimus, Pers.
Satureja cuneifolia, Ten.
Quercus Ægilops, L.
Calamintha suaveolens, Boiss.
Euphorbia aleppica, L.

Ornithogalum refractum, var. *Adalgisa*, mihi.—An *Ornithogalum* which occurs sparingly in the neighbourhood of Otranto, and occupies a place between *O. refractum*, Walds. & Kit., and *O. divergens*, Boreau; resembling the former in the refraction of its fruit-peduncles, while it shows the large flowers and horizontal flower-peduncles of the latter. The flowers are usually few in number, rarely more than five, and more frequently three; thus forming a contrast to the normal species, which usually shows a larger number of smaller blossoms. *O. exscapum*, Ten., is a much smaller plant, and has not the proliferous bulb of the species under notice; which, moreover, in fruit has its peduncles closely adpressed to the scape; for which reason I have decided to attach it to *O. refractum*, although it differs exceedingly from that species in other particulars, as I have just shown. I append a description taken from a fresh specimen.

ORNITHOGALUM REFRACTUM, var. ADALGISA, *mihi*; corymbo paucifloro, floribus speciosis fere tribus raro pluribus, pedunculis floriferis divaricatis, fructiferis refractis scapo applicatis, fructu adscendente, bracteis lanceolatis acutis pedunculo quarto brevioribus, phyllis perigonii late lanceolatis obtusis, staminibus perigonii dimidium æquantibus, foliis late linearibus subacutis arcuatis stria media albula notatis, bulbo prolifero.

A similar plant was sent to me from Monte Collai, near Pola; growing also on calcareous soil, at a height of about 30 feet, which is at about the same level as our specimens.

Phleum græcum, Boiss.—There is also a variety of this with a tendency to *P. arenarium*, L.

Ægilops uniaristata, Vis.

We have now come to the last of our divisions, that of LOCAL SPECIES and varieties. These are necessarily few, as the district is not an extensive one; but the consequent rarity of the plants will compensate for their restricted numbers.

Alyssum leucadeum, Guss.—For many years this species seems to have given the slip to its eager searchers. I now have it from Otranto, where it is very scarce, growing on the Montagna d'Oro, one of the sea-cliffs; and from Gallipoli, where it is extremely abundant, and although it begins to flower in January, I have found it blossoming in June. It is a handsome plant of a pleasing genus; but I have a suspicion that it and *A. gemonense*, L., are varieties of one species. I have never seen the latter growing; but judging from herbarium specimens, there is not that difference in the fruit which one would expect from the descriptions of the two species. Certain it is that the thoroughly mature fruit of *A. leucadeum* does not present the oval form it is represented to possess; and this assertion is only made after some hundreds of plants have passed through my hands. The old station of the Capo di Leuca seems to be lost, as the plant was searched for in vain by Messrs. Porta and Rigo during their excursion to Japygia and Calabria.

Erodium Gussoni, Ten., is frequent in the neighbourhood of Otranto; and has been found more sparingly in other parts of the district. It is perhaps the handsomest of our European Erodiums; and is frequently found flowering in the autumn from shoots put forth by plants which have been injured or partially destroyed by animals during the summer.

ANTHEMIS HYDRUNTINA, *mihi*, sp. nov.—This is one of the discoid Anthemides; and although it bears some similarity to known varieties, it may be distinguished at once by its upright rigid habit and superior height. It is nearer to *A. graveolens*, Boiss., than to any other; although the latter species is radiate, and no discoid form has been observed as yet, as far as I am aware. Moreover, it differs in several particulars from this and other species, as will be seen by the following description. From the *montana* group it is easily distinguished by the conical receptacle. Unlike the greater number of discoid species, which are mountain-plants, our species grows on broken knolls by the Alimini lakes near Otranto, and consequently at a low level and at a short distance from the sea.

ANTHEMIS HYDRUNTINA, *mihi*. Pedalis et sesquipedalis olens, præter pilos lanatos et maculas lanuginosas glabrescens et pallide virens, caulibus ascendentibus numerosis 1–3- rarius 6-cephalis, rhizomate surculos foliosos ascendentes edente, foliis inferioribus ambitu elongato-oblongis bipinnatis in lacinias acutas submucronatas divisis, superioribus pinnatis, brevioribus pinnis apice trifidis vel bifidis interdum simpliciter subulatis, capitulis discoideis mediocribus, involucri lanuginosi phyllis numerosis late lanceolatis obtusis marginibus pallidis scariosis, receptaculo conico elongato, paleis carinatis attenuatis mucronatis glandulosis ad flosculos æquilongis, acheniis albidis sulcato-costatis tetragonis tuberculatis corona valida superatis. Variat foliorum latitudine et surculorum magnitudine. Habitat prope Hydruntum, Japygia in collibus ad lacum Alimini proximis.

Centaurea alba, var.—The number of forms gathered together under the specific name of *C. alba* var. are perfectly bewildering; and it would be well if the Tenorean species *deusta* were admitted, as it would have the advantage of separating two well-marked sections, those of *alba* proper and the *deusta* varieties, which are easily recognized by their physical aspect from the former. In our district the *deusta* varieties hold undisputed sway, growing usually at no great height above the sea, and generally not removed far from it. They may be divided into two sections, the large- and the small-flowered ones. The former are tall handsome plants with robust angular stems and large capitula presenting an oval shape before flowering, while the latter have a much less stature, with subconical flower-heads which are not a fourth part of the size of the former; besides which the plant is so much branched and diffuse as to appear almost decumbent. Late in November of last year I met with a *Centaurea* near Florence which might have been mistaken at a short distance for a *deusta* variety of *C. alba*, until I observed that the spots on the involucre-scales were apparently formed by the application of a thick grass-green pigment, laid on, as it were, in longitudinal lines, and that on the edges of the spots there were a few detached lines of the same pigment having the appearance of glands. Further examination led me to believe that the plant must be a hybrid between *C. alba* and *C. amara*, L., the period of its flowering being that of the last-named species, which is the most autumnal of all our Centaureas. Moreover, the supposed hybrid shows some decided peculiarities when withering which connect it with *C. amara*, whilst its root-leaves partake of the *alba* type. Now in the south of Italy all the *deusta* varieties that I have observed have either a black, brown, or bluish macula, which has not the appearance of being laid on, but of being merely a stain on the scale itself. Can the *deusta* varieties have been brought about by hybridization as well?

I will first describe the small variety of *deusta* found in our district, inasmuch as it seems to be the furthest removed from the typical *alba* form.

CENTAUREA DEUSTA, *Ten.*, var. TENACISSIMA, *mihi.* Aspera fusca tenacissima, caule anguloso ad radicem ramosissimo corymboso; foliis valde costatis in lacinias late lineares mucronatas divisis, radicalibus bipinnatis sæpe arcuatis, caulinibus pinnatis, superioribus spathulatis, summis sub capitulo subconico parvo sitis, involucri phyllis unguiformis scariosis fuscis marginibus albo-membranaceis apice leviter dentatis costa media in cuspidem protracta, flosculis purpureis, acheniis albis lineis longitudinalibus notatis subpunctatis apice biannulatis, pappo nullo. Tota planta pilis validis moniliformibus ornata. Habitat in rupium fissuris prope Callipolem in Japygia.

We see by this description that the brown pubescence, the want of pappus, the smooth achenia, the small size of the capitula, and its totally different habit, serve to distinguish it from the typical *C. alba*, L.

We will now describe a variety of the large-headed section, which grows on the cliff called the Montagna d'Oro near Otranto. The plant is a splendid fellow, and will bear with dignity the name of *nobilis*.

CENTAUREA DEUSTA, *Ten.*, var. NOBILIS, *mihi*. Aspera fusca, caule robusto rigido anguloso erecto, ramis paucifloris vel unifloris; foliis in lacinias mucronatas divisis, radicalibus petiolis dilatatis semiamplexicaulibus, segmentis foliorum late lanceolatis aliquis pinnula unica ad basin ornatis, caulinibus pinnatis segmentis lanceolatis, superioribus integris lineari-lanceolatis vel spathulatis, summis sub capitulo magno globoso sitis. Involucri phyllis membranaceis nitidis ad centrum maculatis inflatis, costa media in cuspidem protracta, flosculis purpureis, acheniis puberulis lineis longitudinalibus notatis, pappo pallido-rufescente seriebus interiori et longiori ad achenium subæquali. Tota planta pilis validis moniliformibus ornata. Habitat ad rupes Montis Auri prope Hydruntum in Japygia.

Contrasting these two forms of the *deusta* section, one cannot help being struck by their divergence in many respects; thus, one has a long pappus and a pubescent achenium, while the other has a smooth fruit and is quite devoid of pappus, in the place of which one finds two rings, one along the edge and another inside the rim. One is a large robust plant of few branches, while the other is remarkable for the number of them, being even intricately corymbose. To give an idea of the variety of these plants, I will mention that I have two forms in my herbarium of the large-headed section from Calabria, one of which has filiform segments to the leaves, and pappus half the length of the whitish achenium, the capitula being large, but less than the var. *nobilis* by a great deal. The other is a branched plant with broad segments to the leaves, the uppermost of which have strong triangular teeth, pappus half the length of the achenium, which is of a beautiful grass-green colour and slightly ribbed, with capitula one third less than the Otranto variety. It is rather singular that the colour of the achenium in the latter plant should be that of the capitular spots of the hybrid found near Florence. Of the smaller section Tenori and Gussone have described several varieties; and in our district we have Tenori's var. D, or *C. Lippii*, Ten., and Gussone's var. *divaricata* and *angustifolia*. In some cases a very short pappus is present, amounting in one case to a few hairs on one side only.

Podospermum Tenorii, DC. = *Scorzonera Tenorii*, Presl, is a rare species, which extends into the neighbouring Calabria.

Campanula Rosani, Ten., the *C. Tenorii* of Moretti and *C. versicolor*, Gussone, is a local variety of *C. versicolor*, Sibth. & Sm., and a very handsome and floribund species, inhabiting the "Pietra dura" or limestone rock (so called to distinguish it from the Tufa so common in these parts, and which is of a much more friable nature) which composes the chines of Leucaspide and the cliffs of the Serra near Gallipoli. It is a robust species, with stems not unfrequently the size of the little finger. Beginning to flower in early autumn, it continues to show its full corymb of bloom for at least two months, which makes it a great acquisition to a country where a fervid sun hurries away the most brilliant flowers before even the summer is passed. The plant flourishes exceedingly on my terrace, being kept indoors during winter; some large gouty rootstocks I brought from Gallipoli during my last visit having furnished stems which began flowering in August and continued until January. It is also easy to raise from the seed.

Verbascum viminale, Guss., grows in many places on the coast, where it keeps company with *V. garganicum*, Ten., which, as its name implies, is also found on Monte Gargano; a headland, although much further to the north, boasting of a climate similar to Japygia.

Salvia hematodes, L., is the rarest of many good Salvias, which have not been enumerated from their forming part of the general Mediterranean flora.

Statice cancellata, Bernh., var. *glabrata*, Guss., differs so much from the typical species of the eastern Adriatic coast, that I have placed it in the local division. It is distinguished not only by its degree of pubescence, but also by its habit, the plant forming dense cushions on the sea-shore, growing in the interstices of the flat boulders which are almost on a level with the sea, and not unfrequently washed over by the waves. The branched rootstocks have frequently the appearance of black coral; and the whole plant is closely adpressed to the rocks. The *Statice virgata*, Willd., which is very rigid here, seems to have some influence on the other species, as specimens are to be found which seem modified in some of their characteristics. On the island of Sant' Andrea, a low mass of rock off Gallipoli, washed from end to end by the waves during winter, I found a charming little *Statice*, which hitherto I have not been able to determine. Perhaps it is a variety of *S. minutiflora*, Guss.; but I prefer to consult the Neapolitan herbaria before arriving at any conclusion on the subject, which, as regards this genus, is sufficiently confused already.

Crocus Thomasii, Ten.—Is an autumnal Crocus which was lost sight of for many years in Italy on account of its having been looked for in the neighbourhood of Gravina, which word is also the local name of a chine; so that the plants that grew near the Chines of Leucaspide bloomed unknown until Sir James Lacaita rediscovered them six years ago on his property, along the edges of the Gravina di Leucaspide, near Taranto, where it is abundant. It is singular that Mr. C. C. Lacaita, his son, should have found the same species in great quantity near a station on the Bari line, where the station-master described it as saffron.

Ægilops triuncialis, var. *breviaristata*, Hack., inedit. ?—This plant was sent by me to the noted authority on Grasses, and named by him as above. As its name implies, it owes its remarkable appearance to the shortness of its awns, which give it a totally different aspect from the normal species. Hackel writes of this variety :—" Forma critica sed vix a *Æ. triunciale* specifice distincta."

Ægilops biuncialis, Vis., var. *biaristata*, Hack., is a very interesting variety, found by Mr. C. C. Lacaita at Leucaspide. The grasses in our district are very interesting, as a general rule; and besides those mentioned, we have *Festuca Fenas*, Lag., *Æluropus litoralis*, Parl., *Serrafalcus Lloydiana*, Godr., *Glyceria festucæformis*, Heynh., *Poa attica*, Boiss. &. Heldr., *Hordeum leporinum*, Link., *Lolium subulatum*, Vis., and many others.

In conclusion, I will remark that I have several species *sub judice*, being unwilling to give a rash judgment on them; so will defer my decision until the publication of the Florula at no distant date.

On the Contrivances for ensuring Self-fertilization in some Tropical Orchids. By HENRY O. FORBES, F.R.G.S., F.Z.S. (Communicated by H. N. RIDLEY, F.L.S.)

[Read 18th December, 1884.]

(PLATES XVI. & XVII.)

DURING my recent sojourn in the Dutch East Indies, I resided for a considerable period on the estate of Kosala in the West Javan hills, where I had excellent opportunities for making many observations on the fertilization of the Orchids growing in the forest in the immediate neighbourhood of the house, or in the garden attached thereto, whither I transplanted many species. Of these observations I desire to lay before the Society the following short account:—

Cymbidium stapelioides, Teijsm. et Binn.—I found this rather rare Orchid in flower at a height of 2600 feet above the sea. I transplanted it to a tree 1000 feet lower down. None of the flowers, which were expanded when I found it, were fertilized, but one of the stems had a solitary capsule. For three weeks the plant remained in the condition in which it was found, its large and somewhat sombre flowers retaining their perfect freshness throughout. I then took compassion on its barren state, and fertilized four of its flowers with pollen from others on the neighbouring stems. These alone bore any fruit. A couple of months later a fine new spike appeared, which I left to its own resources, for between four and five weeks it exhibited a very fine compact truss of twelve flowers; but not one seed-capsule was produced. Insect life at the lower station seemed quite as abundant as at the higher. This Orchid possesses no nectary, and its odour, if not pleasant, is not disagreeable. The viscid disk of the pollinia is remarkable for its elasticity; after removing on my pencil-point the pollinia from the anther and applying them to a stigma, the adhesion between stigma and pollen was not so great as between the pencil and the pollen, the viscid disk stretching quite one eighth of an inch, but yet withdrawing wholly the pollinia from the stigma, without leaving any grains on the stigma. Even after the pollinia had been a week removed from the flower, the elasticity of the disk was unimpaired.

One of the prettiest and commonest Orchids of the neighbourhood was the pure white *Dendrobium crumenatum*, Swartz., of which I have examined thousands of flowers: scarcely one in eighty ever sets a seed-capsule.

Calanthe veratrifolia produces quite a dense head of elegant white flowers; but the number of these that become fertilized is in enormous disproportion to those that fall off barren. I have examined plants in numerous situations, on heights amid the dense forest as well as in open places. I have studied them low down, both in sun and in shade, and I have invariably found that a very small proportion of flowers produce fruit. Generally the pollinia are found in the anther after the fall of the flower; but they are often absent without any pollen being left in return on the stigma.

In five different plants (taken at random from my note-book), out of 360 flowers, 109 were withered with intact anthers, or had lost their pollinia and were unfertilized; 245 had fallen off, 6 only had produced capsules.

Mr. Darwin, in his 'Fertilization of Orchids,' ed. ii. p. 290, enumerates thirteen instances of self-fertilization as coming under his observation—in *Ophrys apifera*, in *Cephalanthera grandiflora*, *Habenaria intacta*, *H. tridentata*, *H. hyperborea*, *Spiranthes australis*, *Neottia Nidus-avis*, *Disa macrantha*, *Epipactis viridiflora*, two *Thelymitras*, an *Epidendrum*, and two or three *Dendrobia*. In the additional instances which I am able to adduce, some will be found fertilized in a manner, I believe, never hitherto described.

Phaius is an exceedingly handsome and attractive genus of Orchids, growing in open and sunny places, throwing up from the large broad radical leaves stout erect flower-stalks, from 1½–2 feet in height, crowded with flowers. In *P. Blumei* the flower-buds are at first erect and white, and enclosed in their bracts; when these fall off, the bifid-tipped nectary can be seen protruding from between the sepals. The pedicel of the flower now begins to twist on its own axis, either to the right or to the left, and continues through 180°, the flower opening in the meantime. When this half-revolution has been completed, the flower has become fully expanded, while the axis of the flower has descended through 90° in a vertical direction, bringing the labellum to a position at right angles to the flower-stalk. The expanded sepals measure laterally from tip to tip 12 to 14 centimetres. Their outer surface is white, and the inner of a rich chestnut-brown; the interior of the labellum, over which the upper sepal arches, is of a beautiful bright purple-magenta colour, while the outside is yellowish white. Its fringed mouth forms a broad landing-stage for passing insects, for whose benefit, moreover, brightly coloured ridges point the way inwards to the nectary, which, unfortunately for the visitor, rarely contains any nectar. The column, embraced by the labellum, is massive, expanding into a stigma 11 millimetres broad, secreting an abundance of viscid matter, crowned with the anther containing eight pollen-masses, whose caudicles, composed of pollen-grains, protrude their tips from beneath the anther-cap. I have examined several species—*P. Blumei*, *P. amboinensis*, and *P. albescens*.

Of the first-named I have examined more than 150 flowers, but I have not yet found one that was not self-fertilized, nor one that I think could well be otherwise than self-fertilized. The flowers of *Phaius Blumei* I have found in two forms, slightly but interestingly different. In the first specimens I examined, the rostellum was a well-developed tongue-shaped projection arching over the deep and caverned stigma, on which lay the caudicles of the pollinia, which have no viscid disk on each side of the central projection. The rostellum falls away toward the external walls of the stigma, diminishing on both sides the breadth of the floor of the anther. On examining an advanced bud, the viscid matter of the stigma is seen to be in large quantity and rather liquid, and as it grows the amount of viscid matter becomes greater and greater, till it overflows the stigma—often before the bud opens; and immediately on its opening inundates the pollinia, which now increase in size, and either advance downwards, sometimes quite obliterating the rostellum, or, retaining their position in the anther, emit their tubes over the narrower portion of the rostellum into the stylary canal. Very often, however, both anther and stigma are quite filled up by the multitude of pollen-tubes and by the swollen pollinia. All these plants produced large and well-filled seed-capsules on every flower. During all my observations I have never seen an insect visit the plants, many of which were so situated that I could visit them many times a day.

Of flowers of the second form I saw many more examples. There was no rostellum, nevertheless the boundaries of the stigma were quite distinct. On examining a young bud, the anther enclosing the pollinia is seen standing vertically erect on the top of the column (that is, of the detached column without reference to its position in the flower), forming as it were a pointed extension of it, and attached to it by a minute filament. As the flower grows, the anther ruptures and rotates forward, and when it has described about 90°, it occupies the position which, if it possessed a rostellum, it would naturally retain; but having none, it continues to rotate through about 70° more till it comes in contact with the face of the column, that is with the stigmatic cavity, which is very large, broad, and full of viscid matter. The whole surface of the lower four pollinia come into contact with the viscid matter and sink well into it; and this viscid matter finds its way gradually into the whole anther. The inner members of the upper row of pollinia sometimes escape the inundation, but it seems of little benefit to the plant for its cross-fertilization, for they invariably remain covered by the anther-cap. The tips of the caudicles, however, remain in most cases unaffected throughout; but I have found it difficult to remove any of the grains of their pollen, for they are not at all viscid; and by the time the *Phaius* has fully expanded, the viscid matter has generally become of too cheesy a consistency for an insect to force any of it on to the caudicles or even to remove any particle of it at all. The inundated pollinia have no obstacles to bar the way of their tubes to the ovary. On cutting open the front of the column, and excavating the mass of cheesy pollinia and their tubes with a blunt pointed instrument, the stigmatic cavity is left empty; it can then be seen that from nearly the top of the column, along the posterior median line, a prominent ridge runs down almost to the ovarium. In the light afforded by the dissection of an *Arundina speciosa* to be mentioned afterwards, this would appear to represent the absent rostellum. Large seed-capsules were produced by every flower of this form. When fertilization has taken place, the flowers close up, and by continued vertical rotation turn their heads towards the earth.

In many instances I have found as many as three supernumerary anthers on the top of the column, on each side of the ordinary central one.

My first acquaintance with *P. Blumei* was in a specimen which had been under cultivation for about a year. I was for a time uncertain whether these peculiarities might not be the result of cultivation, but I have since found numerous examples in a state of nature, presenting the same appearances in every respect.

Here, then, we have an Orchid presenting every attraction to insects to pay the flower, at least, a first visit (when they would find no nectar)—a large showy flower, with some perfume which is not disagreeable, a distinct nectary, an attractive labellum embracing the column, yet self-fertilized, and rarely, if ever, anything else.

The above account of *P. Blumei* would perfectly suit all the species that I have examined growing in their wild state or in cultivation.

Phaius amboinensis and *P. albescens* both seem to be fertilized in almost the same manner as *P. Blumei*. Of the latter (*P. albescens*), however, I have had an opportunity of seeing only one plant, in the Botanical Gardens, Buitenzorg; but on this plant two of the flowers at least were self-fertilized, the others not being in a state permitting of study.

Spathoglottis plicata, Blume, is in general habit, when viewed from a little distance, very like that of *Calanthe*; but the method of fertilization differs from that just described.

The mature column is markedly arched from before backwards; the pollen-masses lie in a rather deep anther, which runs out into a long sharp triangular rostellum far overarching the stigma. The caudicles of the pollinia, composed of pollen-grains, protrude from below the anther-case, and lie on the rostellum, projecting a little beyond its tip. The stigma is triangular, the apex of the triangle extending considerably down the front of the column. There is no nectary.

If a young bud be examined, the stigmatic substance is found to become viscid at an early period. As soon as it has rotated into its normal position, the viscid matter of the stigma begins to increase in quantity—the increase being often so great that it bulges out in front of the rim of the stigma, and swelling up, flows over the margin of the anther by the canal between the column and the edge of the rostellum. I have found that, several days before the opening of the flower, the external pollen-masses on each side are bathed with the stigmatic fluid, and have already swollen somewhat and become viscid. Their tubes proceed along the groove on each side of the rostellum, and meeting together a little below it (the rostellum), proceed along the stylary canal to the ovarium. All the pollinia finally get affected with stigmatic fluid, and emit their tubes by the same canals. The pollen-grains of tips of the caudicles remain unaffected as a rule. The pollinia never move from their natural position in the anther; and were it not for the swelling of the ovary, it would not always at the first glance be easy to say whether the flower was fertilized or not. Concomitant with the flooding of the anther, there has been going on a slow approximation of the underside of the rostellum to the lower lip of the stigma, the long tongue of the former fitting into the downward-pointed projection of the latter. The lower edges of the stigmatic cavity finally embrace the rostellum, by its lower edges growing over the anther-case, and thereby bending down the whole anther, so that when the act of fertilization has been completed, the stigma is almost obliterated, leaving no room for any foreign pollen to be applied to its surface. The pollen-grains of the tips of the caudicles of the pollinia remain, as a rule, unaffected, but, being not viscid, are not easily removable. The operations here described are invariably far progressed, very often completed, before the opening of the flower. So soon as the pollen-tubes have well penetrated the ovary, the flower begins to fade, the labellum becomes brown, assumes the position it had in the unopened bud, and the sepals and petals slowly wither up and cluster round the column.

One of the most interesting terrestrial Orchids that I gathered here was a purple variety of the *Arundina speciosa*, Blume. This cane-like species grows to a height of between 5 and 6 feet, producing without intermission for many months a succession of large and beautiful purple flowers towards the terminal portions of its stems. The labellum is tubular and embraces the column; it has a broad fringed dark purple margin, from which radiate deeper lines converging towards the bright yellow throat, where they merge in two ridges leading to the shallow nectar-depression at the junction of the column and labellum. The open flower stands at an angle of about 60° to the stem, and looks forwards and upwards. The essential organs become so singularly modified that I shall describe them from an early stage in the bud.

In the very young bud, the column is crowned with a 2-celled anther erect on the posterior part of the column by its short filament. Underneath is the stigma, of, roughly speaking, a square shape; its lateral lower borders forming flap-like projections, while the upper border stands erect in front of the pollinia, rising to about one third of their height as a triangular eminence, the rudiment of the rostellum. It is not in every flower that this can be seen well, for the stage next to be described begins very soon, even before the entire column from its base to the summit of the anther-case has reached barely the height of 4 millimetres; it is only by the examination of a very large series that I have been able to follow the modifications that have occurred. The anther now begins to rotate into its natural position, and concurrent with the commencement of this movement some influence (I know not what) causes the top of the rostellum to become inverted close down to the posterior wall of the stylary canal. It occurs even before the anther has rotated a few degrees from its erect position. Along with the invagination of the rostellum the lower lip of the stigma is in consequence dragged upwards. Dissections of the column show that the rostellum goes on gradually elongating down the stylary canal, while the pollinia, slowly continuing to rotate, finally precipitate themselves into the stigma, whose flap-like sides embrace the pollinia within the anther-cap. On the conclusion of these singular movements, no remains of the stigma can be seen; only the swollen and viscid pollinia show slightly between the edge of the anther-case and what was the lower margins of the stigma. As a rule all these operations are concluded before the full expanding of the flower, which, after remaining only a few hours open, fades and envelops the column. The pollinia are thus swallowed up by the stigma, and being bathed by the viscid matter, have only to emit their tubes vertically downwards, while they retain their position in the anther-case. I have found also that in some cases the rostellum is not depressed down the stigmatic canal, but remains in what is the more natural orchideal situation, as a broad flat floor to the anther, and projects far over the stigma. When the flower of *Arundina speciosa* has this form, it invariably, as far as my observations enable me to speak, falls off unfertilized. The pollinia in this form lie far back in the anther, entirely hid by the anther-case, which fits close down all round; and between its external edge and the rim of the rostellum there is a considerable platform. An insect to secure the pollen would require to land on this platform and lift up the anther-case to extract the pollinia; which supposing it to have successfully accomplished, it might wander far to find a stigma to which to apply it. Flowers with this conformation, however, remain expanded and fresh for several days, in marked contrast to those of the first form, which close up in a very few hours. On the upper surface of the rostellum, and in the median line, there is a well-marked ridge which runs out to the tip to form the central promontory of the rostellum.

In describing *Phaius Blumei*, I remarked that there existed on the back of the stigma a prominent ridge running down nearly to the ovarium. Now if we were to suppose the ridged rostellum of *Arundina* to become adherent to the back of the stigma instead of hanging down loose, we should have such a ridge as is seen in *Phaius Blumei*; so that it would seem that this marked ridge of the *Phaius* is a remnant of a rostellum, which has become modified and adherent to the back of the stigma.

Eria albido-tomentosa, Lindl., is an epiphytal Orchid, growing at a height of about 2000 feet above the sea. It is singular in having the flower-stalk and the external parts of the perianth densely covered with a felty mass of white wool. It is rather dull and unattractive as a flower. Its anther is situated above the stigma, is separated from it by a narrow rim-like rostellum, and contains two cells. The stigma is broad and rather shallow; its viscid fluid is gummy and not very liquid.

The following are the general appearances in the bud:—The pollinia are arranged in two cells. The viscid disk of the pollinia (really composed of pollen-grains) occurs high up above the level of the tip of the rostellum. In looking at the column in front, only two of the masses in each cell can be seen; the other two, projecting behind, coalesce at the viscid disk of the pollinia. The process of fertilization seems to be:—A swelling of the viscid matter of the stigma takes place, the anther is more or less inundated through the channels at the side of the rostellum. The outermost pollen-mass in each cell is the first to be touched by the stigmatic viscid matter, as they lie just above the channels by which the stigmatic fluid passes into the anther. The higher pollinia are generally untouched by the viscid matter of the stigma, and after the fertilization of the flower, the lower masses come forward and project over the other two. The pollen-masses themselves are short and somewhat spathulate, and lie against each other by their flat sides. By the touch of a pencil at the spot where the masses converge together, three pollinia, *i.e.* the two hinder and the inner one of each cell, come away early; but the exterior one remains glued, but not firmly (I am describing a bud), to the bottom of the anther, and is removable with some manipulation. The outer pollinia, on becoming smeared with the viscid mass, emit the pollen-tubes, which go down through the stigma as two prominent ridges, which tend to obliterate the rostellum. The flower-bud now expands; for the operations above described have generally taken place before the opening of the bud. The viscid disk gradually loses its viscidity, the outer pollen-masses are firmly glued into their places; the hinder unaffected pollinia cannot be removed in bulk, for they become friable and break up into minute particles which might be removed by any insect visiting the flower, but sometimes their pollinia also become involved in the stigmatic-fluid inundation, and are resolved into a cheesy mass. The flower does not close up its envelopes after fertilization, but the sepals and petals remain gaping. Out of 60 flowers examined, I have not met with one which was not self-fertilized; all, as far as I could judge, having their pollinia intact. The fertilization of this *Eria* seems to resemble that of *Dendrobium chrysanthum*.

An *Eria* near *E. javensis* produces a long truss of rather small flowers. The labellum is slender and winged, and its floor is thickly covered with a fine white pollen-like dust, which can be brushed off with a slight touch, some of which is generally found adhering to the concavity of the upper sepal on the opening of the flower. The column is slender and widens out into a quadrilateral stigma, overhanging which is a well-marked rostellum, on which the pedicels of the eight pollinia repose. The pollinia at first are entirely concealed by the anther-cap, and, if not ruptured on the opening of the bud, are so at a very early period after. The pellucid tip of the rostellum and the pollinia are removable with a very slight touch; but I have almost invariably found that each floret has one or more of its own pollinia on its stigma. The anther-cap on rupturing shrivels and shrinks backwards, entirely disclosing the pollinia, some of which always fall forward out of the anther on to the stigma, in nearly the same way as described by Mr. Darwin in *Ophrys apifera*. The wind will, of course, much aid in throwing forward the pollen-masses on the stigma; but every ovary was fertilized by its own pollinia on a flower shaded and protected in my room. As a rule, not all the pollinia fall on to the stigma; some generally retain loosely their natural situation in the anther, or are dragged forward into various positions. Often, however, they get involved in the swelling of those on the stigma, the viscid matter being conveyed to them through the caudicles of the others, which generally retain their position on the rostellum. On fertilization being effected, the labellum rises up and, embracing the column, hides the essential organs, while the sepals and petals close in and more securely exclude any intruder.

One of the most singular Orchids that has come under my observation is of a species unknown to me, and nearly related, if not belonging, to the genus *Chrysoglossum*. It carries the contrivances for self-fertilization to the utmost limit. It is terrestrial; has long pointed fleshy leaves, and produces a spike about one foot long, with alternate flowers at short intervals. It is not only self-fertilized, but cleistogamous. I first found it at a height of about 3000 feet, where I observed that all the flowers were fertilized, but to all appearance none had ever opened. I brought several plants home and planted them in pots, where they at length threw out new spikes, which appeared to be perfectly healthy. The flowers remained as buds nearly two weeks, during which the ovary daily increased in size; then they shrivelled and dried up, while the ovary enlarged to its full size. On opening it, I found it to be well filled with seeds. The labellum is beautifully marked with lines of purple-carmine; the column with carmine and yellow; but no insect could ever be fascinated and allured by its painted whorls.

The last example is a species of *Goodyera, G. procera*, Lindl. I have found a very large number of the little flowers to be self-fertilized; the pollinia from some cause emit the pollen-tubes while still on the anther, which, travelling by way of the edges of the slit of the rostellum, penetrate the stigma and fertilize the ovary. The flowers were too small for thorough examination with the means at my disposal. The labellum is produced into a kind of nectary. I could not detect whether it contained nectar or not, but its walls are studded with numerous long, narrow, knobbed glands.

Besides these, *Cryptostylis Arachnites* and several other species, which I have not yet been able to identify, presented similar or allied modifications for securing self-fertilization.

From these observations I am inclined to think that a great number of Orchids are self-fertilized. The great family of the Vandeæ, however, seem rarely, if ever, to be self-fertilized; they are either cross-fertilized, or altogether fail to set seed-capsules. Terrestrial Orchids seem more liable to self-fertilization than epiphytic species.

Summary.

In the foregoing pages I have drawn attention to the fact:—(1) that a number of Orchids with showy flowers never set any seed-capsules; and (2) have given additional examples to those mentioned by Mr. Darwin of Orchids of different genera being invariably self-fertilized, and in many cases impossible to be other than self-fertilized; I have also described the mechanism of their fertilization, such as occurs in the species of *Phaius*, in *Spathoglottis plicata*, and other species of the genus, and especially in *Arundina speciosa*. *Eria albido-tomentosa* and *E. javensis* I have never found otherwise than self-fertilized; and a species belonging to a genus near to *Chrysoglossum* I have shown to be cleistogamous. The observations above given would seem, therefore, to support the Rev. G. Henslow's conclusions so ably given in his Memoir on the Self-fertilization of Plants, already published in the Transactions of this Society (n. s. vol. i. pp. 317–398, pl. 46, 1879). My absence abroad prevented my seeing this paper till quite recently, and after I had completed these Notes.

DESCRIPTION OF THE PLATES.

PLATE XVI.

Phaius Blumei.

Fig. 1. Shows a flower in which the pollinia have become much swollen, and slipped down a little below the anther-cap; they are already in contact with the viscid fluid of the stigma. Magnified.

2. Represents a very young bud, greatly magnified; the pollinia are in their erect position. There is no rostellum.

3. A bud still further advanced; the pollinia have rotated somewhat forwards.

4. Shows a flower of the first form as described in the text, with the pollinia and the anther-cap removed, showing the rostellum.

5. Exhibits a flower (of the first form) in which the pollinia are swollen up, and pressing down before them the rostellum, and emitting over its rim their tubes into the stigma.

6. Represents a *Phaius* (of the second form) with the anther-cap removed (but shown dotted in), in which the pollinia are quite bathed in the stigmatic fluid and have become cheesy.

7. Is a longitudinal section, showing the knob *a*, representing the modified rudimentary rostellum; *b* indicates the margin of the stigma.

8. Shows a flower with an extra anther.

Spathoglottis plicata.

9. A bud, showing the swollen-up pollinia appearing below the lip of the anther-cap.

10. Longitudinal lateral section, showing the position of the rostellum and the long caudicles of the pollinia, in somewhat advanced stage.

11. Fully fertilized *Spathoglottis* (of the white variety), in which the flaps of the lower edge of the stigma do not embrace the anther-cap as in

12, which represents the anther-cap (in the purple variety) bound down by the flaps of the column and of the lower edges of the stigma.

Fig. 13. Is a front view of a fully-fertilized flower (of the purple variety), somewhat more enlarged in proportion than the other figures.

14. Represents the same with the anther-cap removed; the pollinia have become cheesy and swollen.

15. Represents an "end on" view of the top of the column, showing the rostellum, and the spots (marked yellow) where the fluid from the stigma makes its way into the anther.

16. Shows the direction taken by the pollen-tubes from the swollen pollinia.

Arundina speciosa.

17. A young bud in which the pollinia are seen *in situ*, and the shape of the stigma is nearly perfect.

18. Is a somewhat advanced bud in which the upper part of the stigma has disappeared, and the lower edges are approximated to the pollinia.

19. Represents an *Arundina* in which the pollinia have rotated quite into the stigma, whose lower lips have embraced the anther-cap.

20. Is a fully-fertilized flower (with the anther-caps removed), with the pollinia shown *in situ* and becoming a cheesy mass. The front of the column has burst, a circumstance which often happens from the great number of pollen-tubes emitted from the pollinia.

21. Is a longitudinal section of a bud, showing the rostellum, which has grown far down the stigmatic canal.

22. Is a figure of a very young bud in which, though the pollinia had scarcely begun to rotate, the stigma had become already much modified and is in waiting for the rotation of the pollinia.

23. Represents what I have termed in the text the more natural orchideal form of the rostellum, where it is a broad platform overhanging the stigma. In this form the flower never becomes fertilized.

Plate XVII.

Eria, sp., near *Eria javensis.*

Fig. 1. A side view of a flower; enlarged.

2. A front view of a flower; enlarged.

3. The labellum.

4. The stigma, with three pollen-masses which have fallen forward on it; and with the anther-cap shrivelled backwards.

5. Represents the anther and rostellum as seen in the bud.

Chrysoglossum, sp.

6. Is the enlarged ovary, showing the shrivelled flower at the top, which had remained as a bud throughout its existence.

7. A young bud (much magnified), showing the position of pollinia with reference to the stigma.

8. Labellum enlarged, and coloured according to nature.

9. A longitudinal lateral section, showing the pollinia which, having become inundated with fluid in the stigma, have emitted their pollen-tubes down into the ovary.

Fig. 10. Is a fertilized flower, opened by me, and coloured, showing the pollinia *in situ*; having become swollen, they have emitted their tubes down the stigmatic canal.

11. Is a natural-size sketch of a portion of the flower-stalk.

Goodyera procera.

12. Represents a fertilized flower with the pollinia-caudicles seen through the slit in the rostellum.
13. Shows a flower in which the anther-cap and pollinia have been removed and in which the stigmatic fluid had swollen up as high as *a*.
14. The pollinia lifted out of the anther, and shown attached by the tips of the caudicles to the top of the rostellum.

Notes on the European and North-American Species of Mosses of the Genus *Fissidens*. By WILLIAM MITTEN, A.L.S.

[Read 19th February, 1885.]

THE recent issue of two important works renders it possible to take a survey of all the Mosses included in the genus *Fissidens* which have been found in Europe and North America. In the first, Dr. Braithwaite's 'British Moss Flora,' nearly all the European species are clearly described and nicely figured. In the latter, the 'Manual of North-American Mosses,' by Lesquereux and James, all the species yet discovered in that region are admirably described in a free and independent manner, devoid of technicalities. In both these works the same sources are quoted, and references made as have been generally acquiesced in since the era of the publication of the 'Bryologia Europea.' These mosses present some remarkable features. In the form of the leaf alone they are immediately distinguished from all others, the foliaceous expansion in two planes, vertical and horizontal, having no analogy to that of the Polytrichoid mosses, where leaf-expansion is in many planes; but is nearest approached by the species of Hepaticæ included in *Gottschea* and *Micropterygium*, in which the presence of an amphigastrium or stipule shows that the unusual form is independent of it as well as of the nerve, which last indeed is absent in some true *Fissidentes* like *F. hyalinus*. Many of the small species have been supposed to be of annual duration; but if favourable specimens are examined, it will be found that it is the fruiting stems which are annual, and that they arise from the axils of the leaves of the stems of the previous season; and if the older stem has sufficiently decayed, these annual shoots, bearing male and female flowers both from the same axil and rooting at their base, appear at the fruiting season as independent stems; if the older stem does not decay, such forms as that observable in *F. inconstans* are produced.

Most of the small apical fruiting species produce their fruit without any special leaflets, usual in other mosses, surrounding the female flower; these are, however, present in the lateral fruiting species. There is also great diversity in the male inflorescence; it may be, like the female, apical, or it may in the same species appear basal, from the short stem on which it is borne; it may be bud-like, in the leaf-axils of the fruiting-stem; and it may also be a bunch of naked antheridia, or even a single antheridium naked in the leaf-axils,—all which states may occur on the same stem. The small calyptra in the lesser species may be found carried up on the operculum entire, or in the same species it may be split on one side.

Dillenius first defined more nearly the species, which became afterwards named *Hypnum adiantoides*, *H. taxifolius*, and *H. bryoides* by Linnæus.

Hedwig, investigating the inflorescence, figures that of *Hypnum bryoides*, Theor. Gen. et Fruct. Pl. Crypt. p. 148, t. xi.; here it is still *Hypnum*. Later he figured on a grand scale *Fissidens bryoides*, Musc. Frond. iii. xxix.,—two fertile stems complete, at their side a stem almost attached by roots, having at its apex a male flower, apart from these a stem with axillary male flowers only, as in his previous figure. The often-excluded fig. 10, when this plate is referred to, is correctly the enlarged apical flower belonging to the principal figures. Here then, quite unconsciously to himself, he had figured a species distinct from that of his first work; or it may be said the idea of it had become dual. The overlooking and mistaking of the import of this figure has made much confusion. Dickson sent to Hedwig a specimen of his *Bryum viridulum*, which, he says, was the same as he had found in the herbarium of Linnæus. To this Hedwig gave the name *Fissidens exilis*, because it was so small; and it is figured in a very inferior manner in his posthumous work continued by Schwaegrichen, t. 38, where it has entire leaves. Swartz described his *Dicranum viridulum*, Weber and Mohr *D. incurvum*, and Turner *D. tamarindifolium.* When Bridel enumerated these, it is seen how species in themselves sufficiently well marked had drifted into confusion. Wilson paid particular attention to the British species, and examined the older herbaria; but some of the conclusions at which he arrived respecting them cannot be maintained.

Fissidens has been monographed by De la Pylaie, in Desvaux's 'Journal de Botanique' (1814), by Bruch and Schimper in the 'Bryologia Europea,' and enumerated by Jäger, who, finding he had made great errors and omissions, went over the whole again, making great additions in his "Genera et Species Muscorum systematice disposita seu Adumbratio Floræ Muscorum totius orbis terrarum," in the 'Verhandlungen der St. Gallischen Naturwissenschaftlichen Gesellschaft,' 1870–1875. In this all the species up to that time known to the author are enumerated; they comprise fifty species placed in *Conomitrium*, thirteen in *Octodiceras*, and two hundred and fifty in *Fissidens*, the species in this genus being enumerated without order or system of any kind, only that the smaller species come first and the larger towards the end; the species with entire, serrulate, margined, immarginate, and erect, or cernuous fruit being mixed in a simple inventory; those species described in the 'Transactions of the Linnean Society,' 1860, are omitted, as is all mention of Seemann's 'Flora of Viti.'

The genus, understood as comprehending *Conomitrium* and *Octodiceras*, has been variously placed. Schwaegrichen, in Hedwig's posthumous 'Species Musc. Frond.,' entirely on peristomial grounds, places it between *Trichostomum* and *Dicranum*; Bridel, with a better appreciation of its characteristics, placed it at the end of his arrangement in his "Classis V. Entophyllocarpi," which contained also *Phyllogonium* and *Drepanophyllum.* In C. Müller's 'Synopsis Musc. Frond.' the genus is placed in the first section *Distichophylla* of his subclass Acrocarpi of the Class III. Stegocarpi; this section includes also *Schistostegeæ*, *Drepanophylleæ*, and *Distichiæ.* Wilson placed the genus between his acrocarpous and pleurocarpous genera; Schimper between *Leucobryaceæ* and *Seligeriaceæ.* Jäger first placed his *Fissidentaceæ* after *Polytrichaceæ* and *Buxbaumiaceæ* as Tribus xviii.; but in the Supplement to his work it is Tribus vii.; and it occupies the position assigned to it by Schimper.

Considering the number of species now known, it is remarkable that so few have been discovered with departures from the common types: only one or two are known with slightly rough setæ, none with the peristome absent; the calyptra differs but very little except in *F. osmundoides*; it is in the leaves with the states of their margins that distinctions are found which, with the form and origin of the fruit, afford characters by which they may be arranged in an approach to systematic order in the following manner:—

A. PLANTS TERRESTRIAL.

* FRUIT APICAL.

Leaves with a nerve.

Leaves with hyaline limb on both laminæ.

Capsule symmetric, erect.

Fertile flowers synoicous.

1. *F. synanthus.*

Inflorescence monoicous.

Male flower bud-like in leaf-axils.

2. *F. bryoides.*
3. *F. rivularis.*
4. *F. impar.*

Male flower basal or terminal.

5. *F. exilis.*
6. *F. viridulus.*
7. *F. minutulus.*
8. *F. introlimbatus.*

Capsule inclined, unequal-sided.

9. *F. Curnovii.*
10. *F. fontanus.*
11. *F. rufulus.*
12. *F. ventricosus.*
13. *F. texanus.*
14. *F. limbatus.*
15. *F. Orrii.*
16. *F. incurvus.*
17. *F. tamarindifolius.*

Leaves with limb on horizontal lamina only.

18. *F. exiguus.*
19. *F. Ravenelii.*
20. *F. Donnellii.*
21. *F. Garberi.*

Leaves with no limb.

22. *F. Bloxami.*
23. *F. Closteri.*
24. *F. Arnoldi.*
25. *F. Hallii.*
26. *F. obtusifolius.*
27. *F. osmundoides.*

Leaves nerveless.

28. *F. hyalinus.*

** FRUIT LATERAL. *Limb none.*

29. *F. taxifolius.*
30. *F. polyphyllus.*
31. *F. polypodioides.*
32. *F. grandifrons.*

Limb of different-coloured cells. Inflorescence monoicous.

33. *F. majus.*
34. *F. collinus.*

Inflorescence dioicous.

35. *F. Langei.*
36. *F. adiantoides.*
37. *F. subbasilaris.*

B. PLANTS AQUATIC=*Octodiceras*, Brid., and partly *Conomitrium.*

38. *F. Julianus.*
39. *F. Hallianus.*

1. F. SYNANTHUS.—By this name it is proposed to designate the synoicous species confused in Schimper's 'Synopsis,' ed. 2, p. 113, with Wilson's *F. viridulus* var. *pusillus*, Bry. Brit. p. 303, where it is described as monoicous, as are his specimens. The specimens sent to Schimper by Dr. Wood from Pontefract, like the excellent ones from Saporta, are synoicous. The species is found also in Cheshire and Sussex. The limb is sometimes incomplete or nearly obsolete on the vertical lamina; in the perichætal leaves the apex of the horizontal lamina is unequal. In the 'Manual of North-American Mosses,' *F. synoicus*, Sull., is referred to *F. inconstans.*

2. F. BRYOIDES of all recent authors, *Braithw. Brit. Moss-Fl.* t. x. E. *a.*—Hypnum bryoides, *Linn. et Hedwig.*

Antheridia enclosed in buds or naked, or even solitary in the leaf-axils of the apical fruiting stems.

Common in Britain and on the continent, ascending to 6000 feet in the Alps; also in America, whence the specimens have a slightly different appearance; but it is there a greenhouse plant.

3. F. RIVULARIS, *Spruce, Musc. Pyren.* p. 318; (F. bryoides var.) *Trimen's Journ. Bot.* 1880, p. 359.

Foliage rigid and dense in substance. Pyrenees and Britain, on stones in streams.

4. F. IMPAR.—Similar to small *F. bryoides*; but with more oblong leaves, having shorter and wider points, the inferior edge of the vertical lamina not continued to the base, mostly

only halfway; limb very narrow or almost obsolete on the vertical lamina; capsule oval or oblong; male flowers bud-like, very minute.—Sussex. The Botanic Gardens, Dublin; sent by Dr. Moore as *F. exilis*, Wils. Canada, Prof. Macoun. Distributed by Drummond as *F. bryoides*, Musc. Amer. 113.

Long mistaken as a strange form of Wilson's *F. viridulus*, the minute axillary flowers having been overlooked. The keel of the horizontal lamina being often without the wing of the vertical, the stems have a different look from all the other small species.

5. F. EXILIS, *Hedw.*, *Schw. Sup.* t. 38.—Skitophyllum exile, *De la Pylaie*, *Desv. Journ. de Bot.* t. 38. f. 1.—Bryum viridulum, *Dicks. ex ipso*!—Fissidens viridulus, *Wils. Bry. Brit.*, so far as relates to the erect fruiting forms.—F. Lylei and the F. pusillus, *Braithw. Brit. Moss-Fl.* t. x. D. *a.*—F. holomitrius, *Spruce*, *Trimen's Journ. Bot.* 1880, p. 356.—F. sepincola, *Mitt. in lit.*

Common on hedge-banks in Britain, fruiting in winter: minute states on stones and rocks in shade, fruit in summer; and some of these may prove different.

Variable in size; and sometimes the least of the European species. When growing, the capsules are erect, the limb is very variable, and the lamina on the horizontal portion on the upper side is unequal. The calyptra is entire, borne on the point of the lid, or it is split on one side; and the difference seems to be an accident of growth.

6. F. VIRIDULUS (Dicranum viridulus, *Sw.*).—F. bryoides, *Hedw. Musc. Frond.* iii. t. xxix.

Leaves less lanceolate than in *F. bryoides*, wider near the point, as observed by Wilson, who found a specimen from Swartz in Smith's herbarium, and supposed it to be a state of his *F. viridulus*. Areolation of larger and more pellucid cells. Fruit-stalk reddish; annulus of a double row of cells adherent. Calyptra split or entire. *F. Sardagnai*, Venturi, Rev. Bry., 1883, p. 93, from Cagliari, may, from description, belong here; but it is said to have the leaves straight when dry. *F. introlimbatus*, Ruthe, Hedwigia, 1870, p. 177, redescribed by Schimper as *F. algarvicus*, C. de Solms; but there are no specimens so named in his herbarium; also *F. subimmarginatus*, Philibert, Rev. Bry. 1884, p. 57, from description, which is very exact, almost enabling a reconstruction to be made, seems to point to this species, which, having been overlooked and omitted in recent text-books, would appear to each observer, as did the British, a nondescript. *F. Loscosianus,* Juratzka, Hedwigia, 1867, No. 10, p. 145, seems also to belong here.—Norway, Sommerfeldt. Good specimens marked *F. viridulus* are in Schimper's herbarium from Dr. Lindberg. Britain, Sussex: one small colony only yet seen. On the Continent probably widely spread, but not abundant?

7. F. MINUTULUS, *Sull. Icon.* p. 37, t. 24.—Very near to that state of *F. exilis* which was called by Wilson "*Lylei.*" Austin referred it to *F. incurvus,* his idea of which was very elastic. —North America.

8. F. CURNOVII.—F. bryoides, var. cæspitans, *Schimp. Syn.* ed. 2, p. 111.—F. bryoides, aquatic state, *Wils.* More robust than *F. bryoides,* stems sometimes more than an inch high. Foliage pale glaucous green; limb everywhere distinct: areolation of small pellucid cells. Fruit-stalk red; capsule, when just mature, green.—South-west England and Lundy Island, on rocks near water; also in Teneriffe. The White Mountains, North America.

9. F. FONTANUS.—F. incurvus, γ. fontanus, *Bry. Europ.*—F. viridulus, var. crassipes, *Wils.*—F. crassipes, var. rufipes, *Schimp. Syn.* ed. 2, p. 114.—F. Mildeanus, *Schimp. in Herb.* It is not quite certain that all these should be included in one species.—Europe and North America.

10. F. RUFULUS, *Schimp., Braithw. Brit. Moss-Fl.* t. xi. B. Similar to the preceding. *F. Panizzii,* De Notaris, may belong to this.

11. F. FLORIDANUS, *Lesq. et James, Man.* p. 83. Described as similar to *F. crassipes,* and as having a long-beaked lid. It may not be correctly placed here.—Florida.

12. F. VENTRICOSUS, *Lesq., Sull. Icon.* p. 45, t. 30. Appears to be similar to *F. rufulus*; but it has the capsule only just exserted above the apical leaves.—California.

13. F. TEXANUS, *Lesq. et James, Man.* p. 86. Described as related to *F. incurvus.*—Texas.

14. F. LIMBATUS, *Sull. in Expl. and Survey Pacific Rail. near 25th Par.* p. 145, t. 1. A small species like *F. incurvus,* but with shorter leaves.—San Francisco, California.

15. F. ORRII, *Lindb., Braithw. Brit. Moss-Fl.* t. x. F. Like *F. incurvus,* but with narrower leaves.—Ireland.

16. F. INCURVUS, *Schw.* t. 49; *Braithw. Brit. Moss-Fl.* t. x. C. *a.*—F. viridulus, var. incurvus, *Wils. Bry. Brit.*—Dicranum incurvum, *Weber et Mohr.*—F. Bambergeri, *Schimp. Syn.* ed. 2, p. 145.—F. Sardous, *De Not. Epilog.*

Leaves about five times longer than wide. Wilson confused with this some erect-fruited specimens of *F. exilis*, which he thought had inclined capsules, and were like those represented by Schwægrichen in his figure, in which the inclined capsule is nearly equal-sided. The true form is difficult to draw; but the foliage is correct. *F. Bambergeri* has the male flowers mostly on long stems like the fertile, but seems not otherwise different. In the most common state the male flowers are on short stems; more rarely there may be several in the leaf-axils of the fruiting-stem, as in *F. bryoides.*—Europe and North America? There it is stated to grow on shaded rocks and stones in streams.

17. F. TAMARINDIFOLIUS.—Dicranum tamarindifolium, *Turner, Musc. Hyb.* p. 55. "Caule simplice; foliis oblongo-ovatis apiculatis; pedicello terminali; capsula cernua; operculo conico."—Skitophyllum tamarindifolium, *De la Pylaie in Desv. Journ. de Bot.* 1814, t. 37 (lid too long); *S. gracile* of the same author, fig. 36 in the same work, is a representation of the largest state. Leaves little more than twice as long as they are wide, with more distinct cells than in *F. incurvus.* The species is well defined by Turner. Wilson did not see the principal specimen in Herb. Turner, which accounts for his remarks respecting it in Bry. Brit.; and his figure represents the stem in the "inconstans" stage, by which he was misled to place it with *F. taxifolius.*—Britain; France. Not elsewhere certainly recorded.

18. F. EXIGUUS, *Sull. Icon.* p. 36, t. 23. A minute species, generally similar to *F. exilis*, with a longer beaked lid. Austin referred it to *F. incurvus.* The figure of *F. pusillus*, var. *madidus*, Braithw. Brit. Moss-Fl. t. x. B. γ, gives a good idea of this, and may represent the same species. In Sullivant's plate the lid is shorter than on his specimens.—America, very common. Britain, damp rocks and stones in shade; fruiting in summer.

19. F. RAVENELII, *Sull. Icon.* p. 39, t. 25. Very small. Leaves almost opaque; nerve pellucid.—Carolina and Louisiana.

20. F. DONNELLII, *Aust., Lesq. et James, Man.* p. 25. Capsule

erect, oval. A minute species found on the roots of trees. —Florida.

21. F. Garberi, *Lesq. et James, Man.* p. 26. Minute; areolation obscure; nerve pellucid; in the specimens examined with James, the flowers were synoicous; Austin thought it "pseudo-dioicous."—Florida.

22. F. Bloxami, *Wils. in Lond. Journ. Bot.* 1845, t. 9.—F. exilis, *Wils. Bry. Brit.*, *Braithw. Brit. Moss-Fl.* t. x. A.

After Wilson had first published this species under the name of *F. Bloxami*, he found on examination of the older herbaria that it had been confused with *F. exilis*, which, when the similarity in size is considered, is not surprising; yet although he had distinguished his species by characters unknown to Hedwig or Dickson, he determined to abandon it, notwithstanding the existence of specimens of *Bryum viridulum* with the entire leaves as in Hedwig's figure.—Europe.

23. F. Closteri, *Austin, Sull. Icon.* p. 44, t. 29. Very minute, like *F. Bloxami*, but with leaves entire.—New Jersey.

24. F. Arnoldi, *Ruthe, in Hedwigia*, 1870, p. 178. "Dioica, exilis, folia 8–10-juga ovato-oblique ligulata omnia non limbata integerrima vel obsolete crenulata, capsula erecta ovata." This may be one of the states of *F. exilis*.—Europe; "in saxis calcareis," Fl. Donau.

25. F. Hallii, *Austin, Lesq. et James, Man.* p. 85. Size of *F. incurvus*, from which it differs in its "immarginate crenulate leaves, the longer lid, and dioicous inflorescence."—Texas.

26. F. obtusifolius, *Wils. in Lond. Journ. Bot.* 1845, t. 9. Very distinct in its rounded leaf-points.—Ohio.

27. F. osmundoides, *Hedw.*, *Braithw. Brit. Moss-Fl.* t. xi. A. Its lobed calyptra is unique in the genus.—Europe and North America.

28. F. hyalinus, *Hook. et Wils.*, *Sull. Icon.* p. 34, t. 21. One of a small group with nerveless leaves.—United States.

29. F. taxifolius, *Hedw. and all authors.*—Europe, North America, N.W. India; said by Jäger to be cosmopolite; but not seen from the southern hemisphere.

30. F. POLYPHYLLUS, *Wils., Braithw. Brit. Moss-Fl.* t. xii. A.—S.W. England, Ireland, Portugal, and Spain.

31. F. POLYPODIOIDES, *Hedw. Musc. Frond.* iii. p. 63, t. 27.—Southern United States. Originally described from the West Indies.

32. F. GRANDIFRONS, *Brid.* Fruit similar to that of *F. adiantoides.* The Mexican *F. strictus* and *F. insignis*, Schimp., are by Bescherelle referred here; and *F. subgrandifrons*, C. Müller, Bot. Zeit. 1864, p. 339, cannot be distinguished. Fertile specimens were gathered in N.W. India by Falconer.—Europe, North America, N.W. India.

33. F. MAJUS.—F. adiantoides, *Bry. Europ. and succeeding authors, Braithw. Brit. Moss-Fl.* t. xii. B. Areolation of cells twice the size of those in *F. adiantoides*, and less obscure.—Europe; North America; Tasmania.

34. F. COLLINUS.—Much smaller than *F. majus,* with its areolation obscure as in *F. adiantoides*, yet with much larger cells. Very variable in the height of its stems, from half to an inch and a half. Fruit not different; capsules in the short state nearly erect, in the taller horizontal.—Chalk Downs, Sussex. Not identified off that formation, where it is common in the turf amongst grass, and may be passed over as *F. taxifolius.*

35. F. LANGEI, *De Not. Epilog.* p. 479.—F. serrulatus, *Schimp. Syn.* ed. 1, p. 107; *Braithw. Brit. Moss-Fl.* t. xi. C.—Size, habit, and appearance exactly that of *F. serrulatus,* Brid., found in the Atlantic islands; but with leaves everywhere having a distinct coloured border, of which there is no vestige in the true *F. serrulatus.* De Notaris says the perichætia are lateral. The areolation of the leaves is also different.—S.W. England; Portugal; Italy.

36. F. ADIANTOIDES, *Hedw. Musc. Frond.* iii. t. xxvi.—F. cristatus, *Wils., Mitt. in Journ. Linn. Soc.*—F. decipiens, *De Not. and all recent authors*; *Braithw. Brit. Moss-Fl.* t. xi. D.—F. rupestris, *Wils. MS.* Of this species Hedwig says, Musc. Frond. p. 61:—"Flos masculus alaris. Fœmineus itidem alaris proprii individui;" and Bridel, Bry. Univ. ii. p. 704, "Flos dioicus." In the 'Bryologia Europea' it was described and figured, without comment, as monoicous. *F. cristatus* was a name given by Wilson before he had distinguished his *F. rupestris*, which was a shorter state;

and he probably assumed the Indian specimens to be distinct. Until De Notaris distinguished his *F. decipiens*, the two species confused had passed as one; but when they are divided, it is clear that Hedwig had already fixed the idea of *F. adiantoides*, by describing it as dioicous; and that the overlooked one was the one here enumerated as *F. majus*, which the older authors thought to be a bog species, and which Dillenius describes, p. 264, as "*Hypnum* taxiforme palustre ramosum, majus et erectum." The *Hypnum adiantoides* of Linn. Sp. Plant., has "fronde pinnata ramosa erecta medio pedunculifera." Here the "palustre" is omitted. Ray had in his character "aquaticus;" and this mention of its habitat points rather to the species here marked as *F. majus*, *F. adiantoides* being more a rupestral moss. It is remarkable in this species that the specimens from America are all, as figured by Sullivant, very much smaller in all their parts except the floral leaves. It is probably the most generally as well as the most widely distributed species known.—The whole temperate northern hemisphere.

37. F. SUBBASILARIS, *Hedw.*, *Sull. Icon.* 26.—A small tufted species with erect fruit.—North America.

38. F. JULIANUS, *Savi* (Fontinalis), *Brid.* ii. p. 678.—Italy and West France. It should be looked for in the clear streams of S.W. Britain.

39. F. HALLIANUS, *Sull. et Lesq.*, *Sull. Icon.* p. 48, t. 28. A much shorter-stemmed and tufted species.—New Jersey and Illinois.

On the Occurrence of *Lycopodites* (*Sigillaria*) *Vanuxemi*, Göppert, in Britain, with remarks on its Affinities. By ROBERT KIDSTON, F.G.S. (Communicated by Dr. J. MURIE, F.L.S.)

[Read 4th June, 1885.]

(PLATE XVIII.)

SINCE writing my previous paper, "On a new Species of *Lycopodites* from the Calciferous Sandstone Series of Scotland"[*], Lesquereux, in the third volume of his Coal Flora[†], has described four new species of *Lycopodites*:—*Lycopodites arborescens*, *L. flexifolius*, *L. simplex*, and *L. Lacoei*.

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[*] Ann. & Mag. Nat. Hist. Aug. 1884, p. 111.

[†] Description of the Coal Flora of the Carboniferous Formation in Pennsylvania and throughout the United States, vol. iii. p. 778 (1884): Harrisburg.

Of these I think the last two must be regarded as doubtfully referable to *Lycopodites*, Goldenberg; but *L. arborescens* and *L. flexifolius* are two most interesting additions to Goldenberg's (not Brongniart's) genus.

The first-mentioned author formed, or, more correctly, resuscitated the Brongniartian name *Lycopodites* in 1855* for a then new class of Palæozoic plants, "true herbaceous Lycopods;" but to enable Lesquereux to include his lately-discovered species in this genus, he was under the necessity of slightly modifying Goldenberg's definition of *Lycopodites*, by adding the term "or woody," to enable him to place in it plants which were evidently not herbaceous, but which probably did not otherwise differ from those species previously placed in *Lycopodites* by Goldenberg.

The generic definition of *Lycopodites*, Goldenberg, so emended, must now read:—

Herbaceous or woody plants with dichotomous ramification; branches with leaves placed spirally or in verticils, leaves of the same or of two different forms on the same branches; sporangia placed in the axils of the leaves or forming terminal cones.

The addition of the term "woody" was rendered necessary on account of the size of the stem of *Lycopodites arborescens*, Lesq., which in every other character is referable to Goldenberg's genus: hence the slight modification of the generic terms of Goldenberg's *Lycopodites*, as proposed by Lesquereux, seems quite legitimate. It is also possible that Goldenberg's type-specimens were only branches of a comparatively large-stemmed plant; but whether Goldenberg's plants were herbaceous or not, it is most improbable that *Lycopodites arborescens*, Lesq., or *Sigillaria Vanuxemi*, Göppert, were herbaceous, the latter of which I now propose to include in *Lycopodites*, Goldenberg.

Lycopodites (*Sigillaria*) *Vanuxemi* was first figured by Vanuxem in 1842†. He gives a description of the plant without applying any name to it, but expressed the opinion that it was more closely related to *Lepidodendron* than to any other genus. This specimen was discovered in Allan's Quarry, near Oswego, New

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* 'Flora Saræpontana Fossilis,' Heft i. pp. 9, 10.

† 'Geol. of New York,' part iii. p. 184, fig. 51.

York, in rocks belonging to the Chenning Group (Upper Devonian). In 1852 Göppert named it *Sigillaria Vanuxemi*[*].

Although several notes on this species occur in the literature of fossil Botany, till the discovery of the British specimens, the type figured by Vanuxem seems to have been the only individual of the species known.

Before fully stating the considerations which have led me to place this plant in *Lycopodites*[†], in preference to retaining it in *Sigillaria*, it is necessary to describe the specimens on which these views as to the systematic position of this species have been founded.

For the specimens of *Lycopodites* (*Sigillaria*) *Vanuxemi*, which have been submitted to me for examination, and of which are figured on Pl. XVIII. some of the more characteristic and better preserved examples, I am indebted to the Council of the Kendal Museum, as also to Mr. R. Bullen Newton, F.G.S., of the British Museum, South Kensington, through whose agency they were communicated to me.

Description of Specimens.

Figure 1. This specimen, of which fig. 1 shows (natural size) the upper portion, is about 13 centim. long and about 2·5 centim. wide, though its original breadth must have been greater, as its full width is not shown in the fossil. The leaf-scars are more distinct on the upper than on the lower part, where they are somewhat obscured by coaly matter. They are hexagonal, about 6 millim. long by 5 millim. broad; the angles formed at the point of junction of the slightly raised boundary lines of the leaf-scars are acute, though the two angles at the upper part of the leaf-scar have occasionally a tendency to become rounded. No distinct trace of any vascular cicatricule is shown on this specimen. The broadest part of the leaf-scar is slightly above the middle.

Figure 2. This figure, which is natural size, shows the mode of growth of the younger branches. The specimen is not very distinctly preserved, but it exhibits at various points the form and size of the leaf-scars, whose outline is defined by a carbonaceous stain. On the upper branches the leaf-scars are much longer than broad, perfectly flat, and bear a single vascular cicatricule, which is indicated by a dark point situated slightly above the centre. The leaf-scars on the lower portions of the stems are distinctly hexagonal, about as broad as long, and show in several cases the scar of the vascular bundle, which is indicated by a small dark point. The branches appear to divide dichotomously; but this character is better seen on some of the other examples. This fossil is labelled " Shap Toll-bar, J. Ruthven."

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[*] Foss. Flora d. Uebergangsgebirges, p. 249 (1852).

[†] I have already stated my objections to the use of the generic name *Lycopodium* for these fossils in Ann. & Mag. Nat. Hist. Aug. 1884, p. 114.

Figure 3*a*. This shows a small fragment of a branch from another part of the same slab as that from which fig. 2 was taken, and gives the form of the leaf-scars on the younger branches.

The stem here, as in the previous specimens, is flattened by pressure. The leaf-scars are indicated by a brown carbonaceous outline. Fig. 3*b* is the same enlarged.

Figure 4. This is a small portion of a young branch, natural size, given to illustrate the form of the leaf-scars, which is broadly fusiform.

Figure 5. An enlarged sketch of a portion of a small branch (marked *a* on fig. 2) is given at fig. 5, to show more fully the form of the leaf-scars and their relationship to each other. They are broadly fusiform; the upper and lower extremities of the leaf-scars are separated by a slight interval, though the scars laterally rest upon each other.

The hexagonal form of the leaf-scars, eventually assumed on the older branches, is evidently the result of mutual pressure and the lateral tension exerted on them by the increase of the stem in girth. The leaf-scars show a single elongated vascular cicatricule; in the older stems (fig. 2*b*) the vascular cicatricule appears to be punctiform.

Figure 6. One of the stems on this slab exhibits very clearly the dichotomous ramifications of the species. The branch is shown in section, as the separation of the stone has passed through the central axis of the stem. Most of the leaves with which it is clothed are likewise shown in section, but towards the upper part of the left arm of the fork their form is indicated, though not distinctly. At the part marked *a* (fig. 6*a* gives an enlarged sketch) the shape of the leaves is more clearly exhibited, as one of them extends beyond the broken extremity of a small branch. Owing to the imperfect state of its preservation, no trace of a central vein is observable.

General Remarks.

The leaf-scars on the young branches are *Lepidodendroid* in form, but do not touch each other at their upper and lower extremities, though they meet laterally. In the older condition they become hexagonal, and appear to have had only one vascular cicatricule.

The leaf-scars differ from those of *Sigillaria*, not only in their form, but in their apparently possessing only a single vascular cicatricule. The branches also ramify more freely than do the stems of *Sigillaria*, and in this respect they approach more closely to *Lepidodendron*; but from this last-mentioned genus, the form of the leaf-scar, as also the shape of the leaf itself, excludes *Lycopodites Vanuxemi*, Göppert, sp.

In favour of placing *Sigillaria Vanuxemi*, Göppert, in *Lycopodites*, Goldenberg, there is the form of the leaf, which is very similar to that of several other species of the genus; the free dichotomous mode of ramification of the branches is also of the same nature as that occurring in *Lycopodites*.

It is true that none of the other species of this genus show the pronounced hexagonal leaf-scars that occur on the older stems of this plant; but this character only appears on the older branches, and is entirely absent from the younger ones, even from those branchlets which are organically united to stems showing the hexagonal markings. From these considerations, I think I am justified in placing *Sigillaria Vanuxemi*, Göppert, in *Lycopodites*, Goldenberg.

Lycopodites Vanuxemi, Göppert, sp., must not, however, be confused with *Lycopodites Vanuxemi*, Dawson, for which the latter author subsequently created his genus *Ptilophyton**.

Two distinct plants having at different times borne the same name are calculated to produce confusion, but as the plant which originally bore the name of *Lycopodites Vanuxemi* has been removed to a new genus, and as I am unwilling to introduce a new specific name for a plant which has so long gone under the distinctive appellation of "*Vanuxemi*," I trust that this note of warning may avoid any confusion in future between *Lycopodites* (*Sigillaria*) *Vanuxemi*, Göppert, and *Ptilophyton* (*Lycopodites*) *Vanuxemi*, Dawson.

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* Synonymy of PTILOPHYTON VANUXEMI, Dawson.

Ptilophyton Vanuxemi, Dawson, Foss. Plants of Devon. and Upper Silur. Form. of Canada, part ii. p. 119 (1882).

Lycopodites Vanuxemi, Dawson, Quart. Journ. Geol. Soc. vol. xviii. p. 314, pl. xvii. fig. 57; Dawson, Foss. Plants of Devon. and Upper Sil. Form. of Canada, part i. p. 35; Lesquereux, Coal Flora of Pennsyl. p. 362; Hall, Report on the Geol. of New York, p. 273, fig. 125 (1843); Vanuxem, Report, Geol. of New York, part iii. p. 175, fig. 46 (1842).

These notes are concluded with a description of *Lycopodites Vanuxemi*, Göppert, sp., embodying the additional characters observed on the British examples.

LYCOPODITES VANUXEMI, Göppert, sp.

1842. Vanuxem. Geol. of New York, part iii. p. 184, fig. 51.
Sigillaria Vanuxemi.
1852. Göppert. Foss. Flora d. Uebergangsgebirges, p. 249 (Verh. d. k. Leop.-Carol. Akad. d. Natur. vol. xxii. Supp.).
1862. Dawson. Quart. Journ. Geol. Soc. vol. xviii. p. 307, pl. xii. fig. 7.
1863. Hall. 16th Annual Report on Condition of State Cabinet of Nat. Hist. p. 113: Albany.
1871. Dawson. Fossil Plants of Devon. and Upper Silur. Form. of Canada, part i. p. 21.
1880. Lesquereux. Coal Flora of Pennsyl. vol. ii. p. 505.
? *Knorria imbricata* (in part).
1869. Ludwig. Pflanzenreste aus den paläolithischen Formationen der Umgegend von Dillenburg, Biedenkopf und Friedberg und aus dem Saalfeldischen. Palæontographica, vol. xvii. p. 124, pl. xxvi. fig. 5.

Description:—*Stem dividing dichotomously and attaining a diameter of over 2·5 centim.; leaf-scars arranged in spirals, on the younger branches fusiform, resting upon each other laterally, but separated vertically by a slight interval, those on the older branches hexagonal and contiguous; vascular cicatricule single and situated slightly above the centre. Leaves cordate-acuminate. Fructification unknown.*

Remarks:—The small fragment of a stem figured by Ludwig as *Knorria imbricata* (*l. c.*) may perhaps belong to this species, at least the figure leads one to this conclusion.

Horizon.—The type of the species was discovered in the Upper Devonian (Chemung Group) of New York, but the British examples originate from a higher horizon.

Mr. G. Sharman has kindly forwarded to me a sketch-section of the rocks in the neighbourhood of Shap by Mr. Goodchild, from which it appears that the Shap specimens were collected from the lower beds of the Mountain Limestone as developed in that area. These rocks are probably of the same age as part of the Calciferous-sandstone series of Scotland.

Locality.—Shap Toll-bar, Westmoreland.

DESCRIPTION OF PLATE XVIII.

Lycopodites Vanuxemi, Göppert, sp.

Fig. 1. Old stem, showing the form of the leaf-scars. Nat. size.
2. Younger stems, showing their mode of ramification and the different form of the leaf-scars on branches of different ages. Nat. size.
3 *a*. Small fragment of branch, showing leaf-scars. Nat. size.
3 *b*. Same, enlarged.
4. Small fragment of branchlet. Nat. size.
5. Small fragment of branchlet. Enlarged to show form and arrangement of the leaf-scars and vascular cicatricule.
6. Specimen showing the leaves and dichotomous division of the stem.
6 *a*. Leaf. Enlarged.

Note.—Specimen Fig. 1 bears no locality, but is probably from the same neighbourhood as the others, though its matrix is slightly more crystalline.

On the Occurrence of Articulated Laticiferous Vessels in *Hevea*. By D. H. Scott, M.A., Ph.D., F.L.S. (From the Jodrell Laboratory, Kew.)

[Read 18th June, 1885.]

In a paper published in the 'Quarterly Journal of Microscopical Science' for April 1884, I showed that the laticiferous tissue in the genus *Manihot* consists of *vessels* owing their origin to cell-fusion, and not of inarticulated laticiferous *cells*, as in the Euphorbiaceæ previously investigated. In a note appended to this paper I gave reasons for believing that the same statement holds good of the laticiferous tissue in *Hevea Spruceana*. Since that time I have received abundant material of the seedlings of *Hevea brasiliensis* from Peradeniya, through the kindness of Dr. Trimen. The specimens were preserved in arrack, and arrived in perfect condition. This material represented the history of the seedling during 25 days, from the 11th to the 36th after sowing, two seedlings having been taken up for each day. The youngest show the very first stages of germination, the radicle having scarcely begun to burst the envelopes of the seed on the 11th day. In the oldest the stem has attained a length of about ten inches, and already bears a pair of (opposite) well-developed leaves.

The investigation of this material has resulted in the complete confirmation of the conclusions arrived at from my previous examination of the older stem of *H. Spruceana.* The differences chiefly affect details, the most important being that the hypodermal system of laticiferous vessels described in *H. Spruceana* is absent in *H. brasiliensis,* at any rate in the hypocotyledonary stem and the first epicotyledonary internode. Other differences no doubt depend on the different stages of development of the plants investigated.

In the embryo of *H. brasiliensis* at the commencement of germination histological differentiation has already made considerable progress. At this stage the radicle is extremely short, with a very blunt apex, which is surrounded by a whorl of young lateral roots. The hypocotyledonary stem is very short, and there are two large broad cotyledons. During germination the latter remain imbedded in the endosperm. As might be expected, the tissues of the cotyledons are at the beginning of germination more advanced in their development than those of any other organs of the embryo. The network of vascular bundles is well differentiated, many elements of the xylem having the usual spiral thickenings already formed. The laticiferous tubes occur on the phloëm side of all the bundles, and are limited to this position, none of them being present in the parenchyma between the bundles. They are already well developed, and form a complex anastomosing system containing abundant latex. Numerous and extensive perforations occur in the lateral walls. The cotyledons afford the most favourable material for the observation of the mode of development. Though the differentiation of the laticiferous tissue is so far advanced, the absorption of the transverse walls is still by no means complete. In many cases a rim of cellulose remains, marking the position of a wall, the greater part of which has disappeared (fig. 2, t^1 and t^2). In other cases we find a perforation at one side of the transverse wall, the latter still extending across more than half the diameter of the vessel (figs. 1, 2, *t*), while in others again the transverse walls, though reduced in thickness, show no obvious perforations. Here, then, we once more have an example of what appears to be a very general rule in the development of these vessels, namely, that the perforation of the lateral walls begins at an earlier stage than that of the transverse walls *.

The examination of the laticiferous tissue of the cotyledons thus suffices to determine finally the true character of this tissue in the species under consideration, and shows that here, as in the genus *Manihot*, we have to do with *articulated vessels*, as distinguished from the *inarticulated cells* of many other Euphorbiaceæ.

Fig. 1.

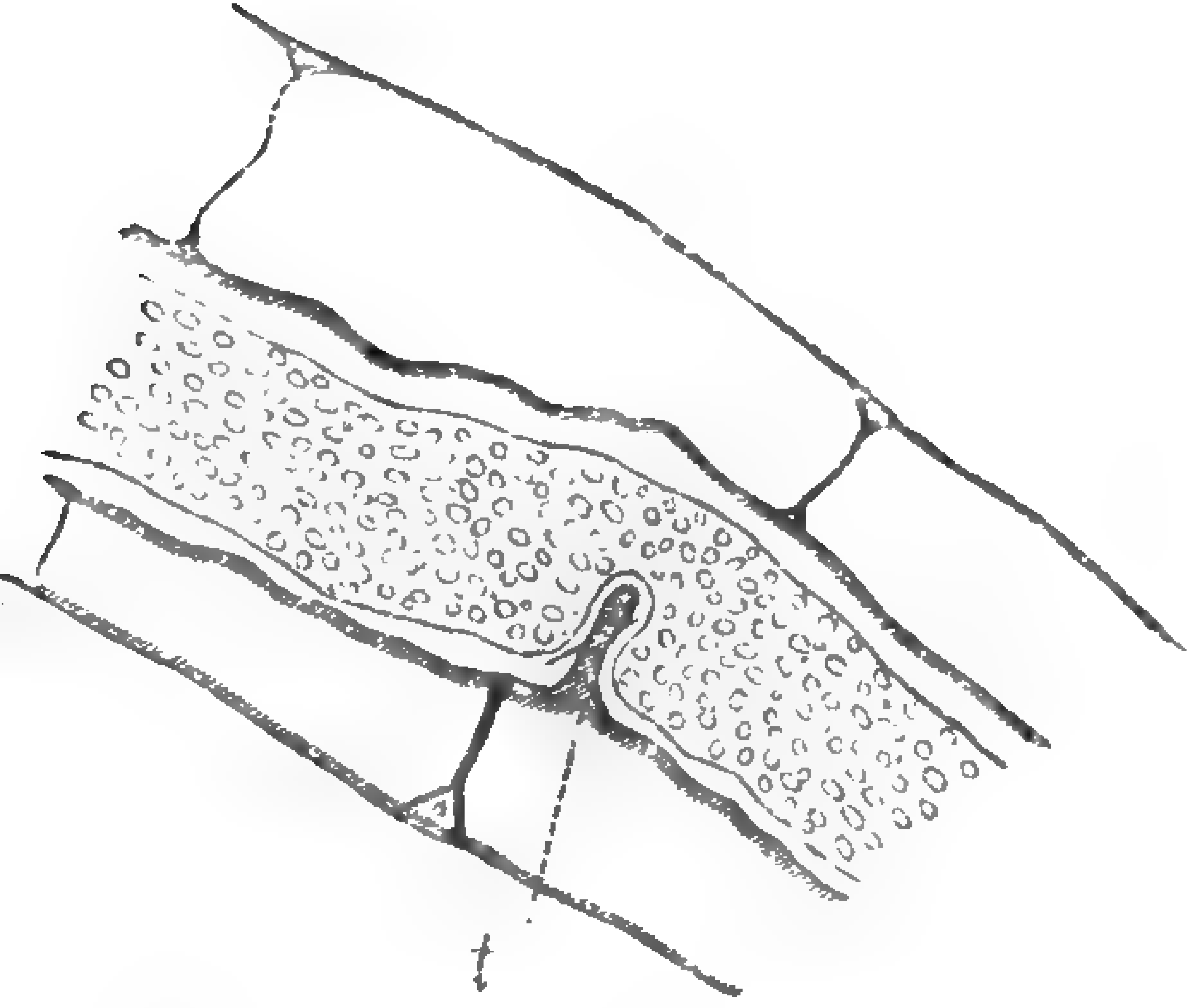

Fig. 2.

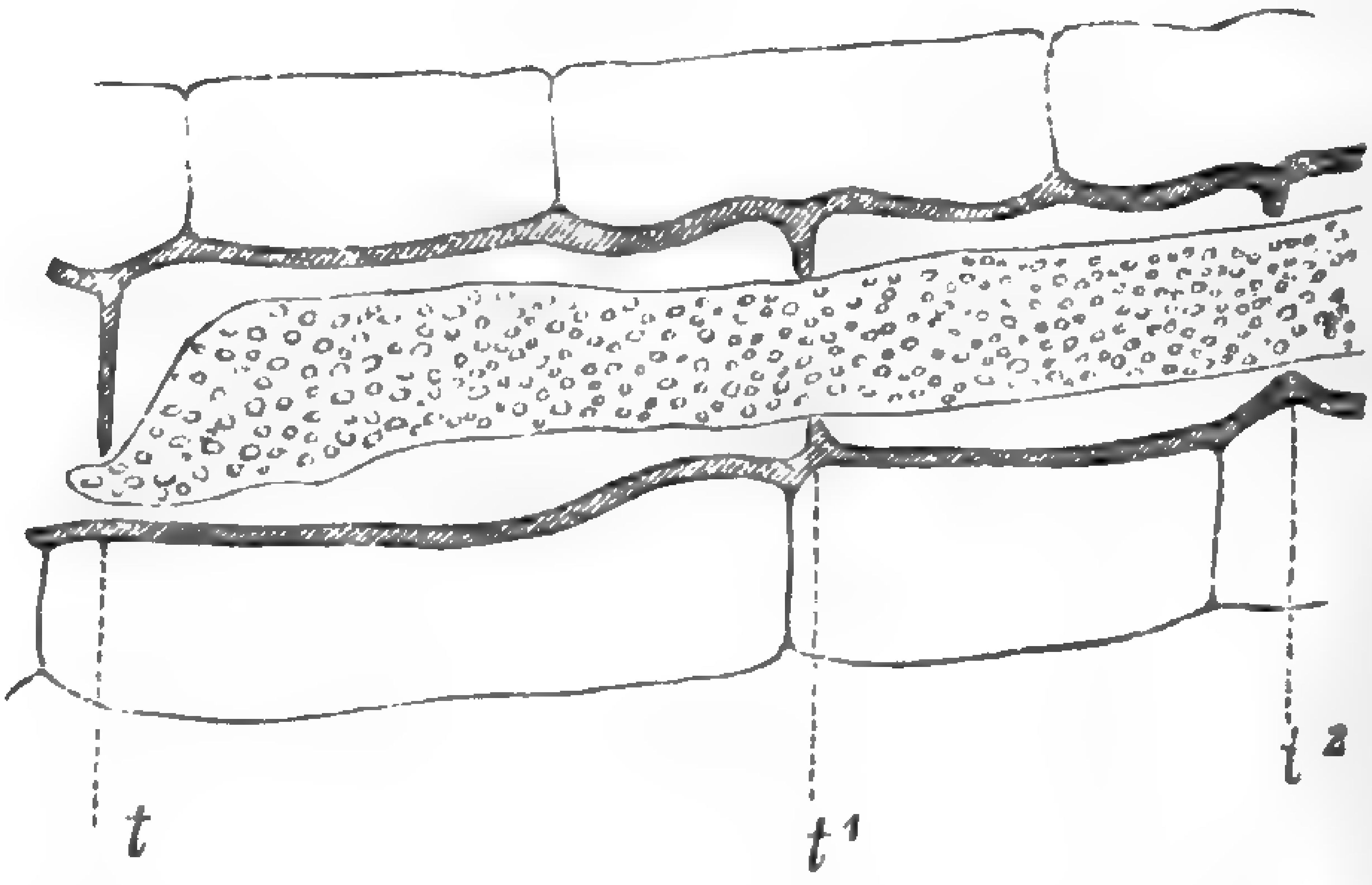

Fig. 1. *Hevea brasiliensis.* Portion of tangential section from a vascular bundle of a cotyledon at the commencement of germination. Part of a laticiferous vessel is shown with a transverse wall broken down at one side, at *t*. ×360.

Fig. 2. Similar preparation, showing transverse walls in process of absorption at *t*, t^1, and t^2. At *t* the perforation is on one side; at t^1 and t^2 it is central. ×460.

The hypocotyledonary stem at the commencement of germination has a "thickening ring" in Sanio's sense; that is to say, between pith and cortex there is a zone of meristematic tissue from which the vascular system is in process of development. It is an interesting fact that whereas at this stage the xylem of the bundles is but little developed, showing only a few elements of the protoxylem with spiral thickening, the laticiferous tissue is well advanced. It already forms an extensive network of anastomosing tubes, lying on the outside of the thickening ring. Here also traces of the absorbed transverse walls may be observed. It is impossible to doubt that this tissue plays an important part in conveying the food-substances derived from the endosperm, through the cotyledons, to the developing organs of the embryo *. From this point of view its early development is quite intelligible, while the relatively backward condition of the xylem is explained by the fact that no demands can be made upon its function as water-conducting tissue until the roots are able to take up water from the soil.

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* *Cf.* Schmalhausen, Beiträge z. Kenntniss d. Milchsaftbehälter d. Pflanzen, 1877, p. 23; Scott, Quarterly Journal of Micros. Sci. 1882, p. 148. Also the paper on *Manihot* above cited.

At a much later stage of germination the development of the xylem was still found to have gone on but slowly. Thus in the main root, when it has attained a length of nearly 4 centims., scarcely any of the vessels are differentiated at a distance of 2 centim. from the apex, while in the hypocotyledonary stem and epicotyledonary internode of similar seedlings, the xylem, though more advanced, is still backward compared to the laticiferous tissue. As regards other elements of the bundles, the sieve-tubes appear at a relatively early stage. These organs are well developed, both in *H. brasiliensis* and *H. Spruceana*; so that in this genus, as in *Manihot*, we find no signs of that reduction of the sieve-tubes which is supposed to characterize plants with abundant laticiferous tissue †.

The laticiferous vessels cannot be traced into the apical cone above the youngest leaves. This is what would be expected from their relation to the leaf-trace bundles. I found this to be also the case with the laticiferous vessels of the Cichoraceæ ‡.

To my observations on *Hevea Spruceana*, I have not much to add. Figs. 3 and 4 show laticiferous vessels from the phloëm in tangential and radial section respectively. In fig. 3 the characteristic lateral anastomoses are conspicuous, and at *t* the remains of a transverse wall are visible. There is no doubt that here, as in *Manihot*, transverse walls are present at first, which in most cases afterwards entirely disappear. The oblique walls with numerous perforations, described in my note in the 'Quarterly Journal' as terminal, are in reality portions of the lateral walls, owing their oblique position to the curved course of the vessels where they pass round the ends of the medullary rays. As stated above, all the more important observations as to structure and development of the tissue in question may be taken, *mutatis mutandis*, as applying to both the species alike.

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* *Cf.* Haberlandt, Physiologische Pflanzen-Anatomie, 1884, p. 227.

† For the prevalent views on this point *cf.* De Bary, Comparative Anatomy, translation, pp. 432 and 525.

‡ Quarterly Journal Micr. Sci. 1882.

Fig. 3.

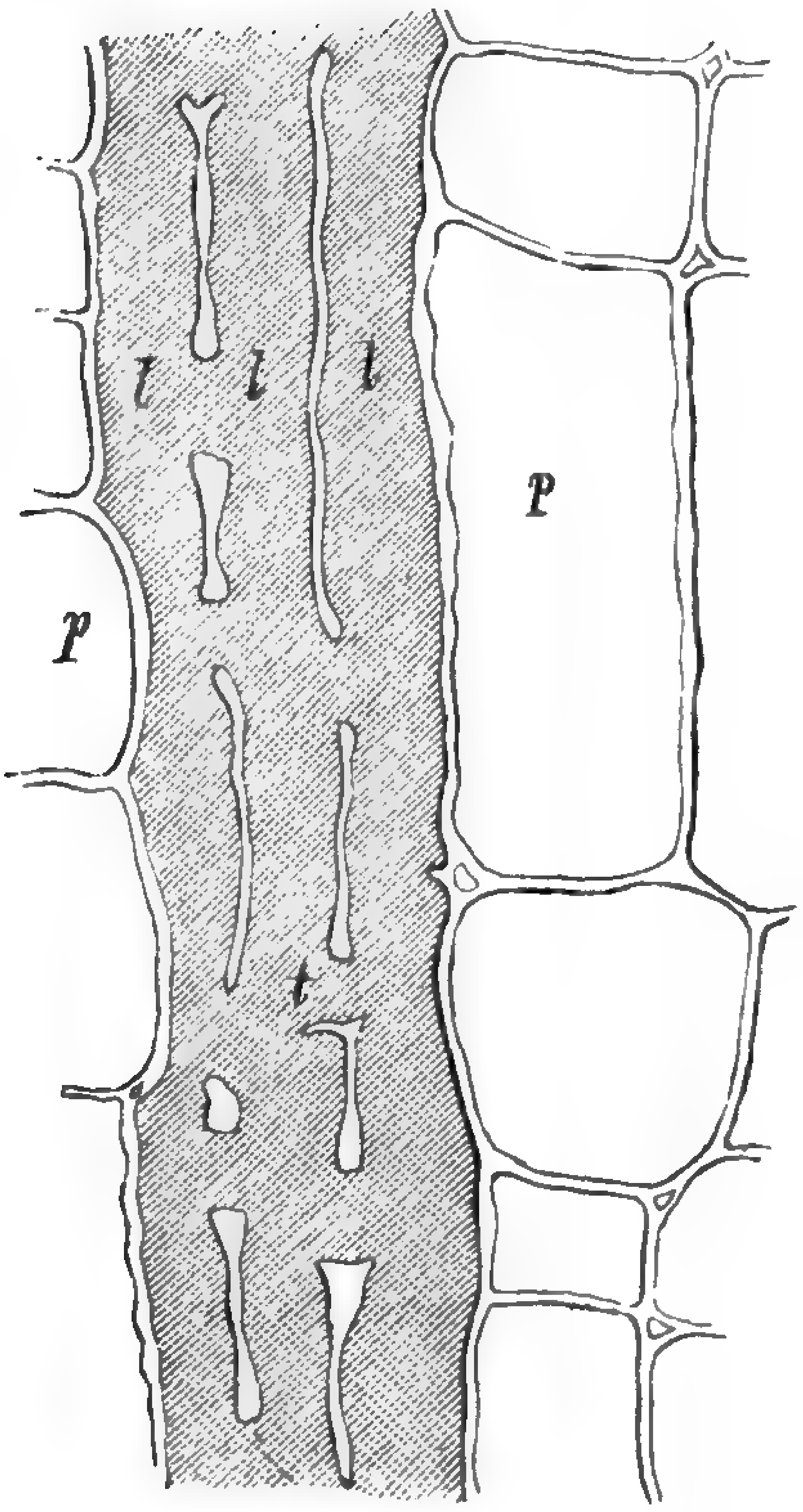

Fig. 4.

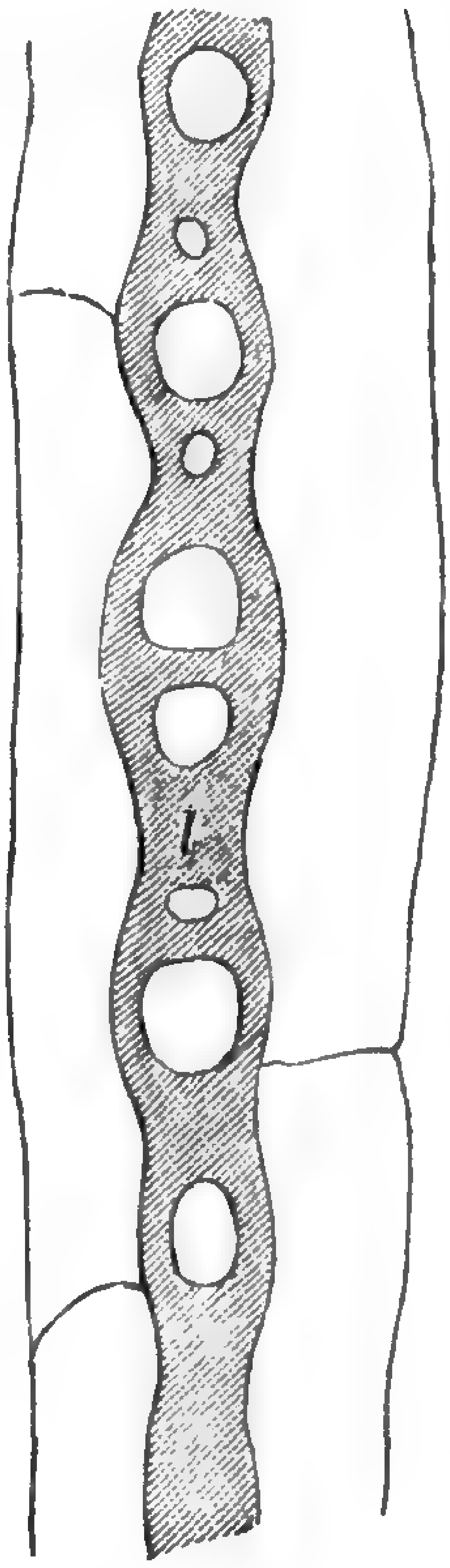

Fig. 3. *Hevea Spruceana.* Tangential section from outer part of phloëm of a stem about 7 millim. thick. *l*, laticiferous vessels with perforations in their lateral walls; at *t*, remains of a transverse wall; *p*, phloëm parenchyma. ×365.

Fig. 4. *H. Spruceana.* From a radial section of the phloem; *l*, laticiferous vessel seen from the surface, showing perforations in the lateral wall. ×460.

Since the publication of my papers in April 1884, a work has appeared by Dr. Pax in Engler's 'Jahrbuch für Systematik,' having for its subject the Anatomy of the Euphorbiaceæ in relation to their Classification. The author has investigated the anatomy of species belonging to a very large number of genera, and has arrived at some conclusions bearing on my present subject. As the result of his very extensive observations, Dr. Pax makes the important statement* that only a small portion of the large family of the Euphorbiaceæ possess inarticulated laticiferous tubes, such as were investigated by Schmalhausen. Dr. Pax tabulates the results of his investigations on this point as follows:—

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* Engler's Jahrb. für Syst. xv. 1884, p. 404.

1. Laticiferous tubes absent:—*Caletieæ*, *Ampereæ* (?), *Phyllantheæ*, *Bridelieæ*, and *Ricinocarpeæ*, ex p.

2. Laticiferous tubes replaced by articulated sacs; individual cells of approximately equal length:—*Ricinocarpeæ* ex p., *Acalypheæ*, and *Dalechampieæ.*

3. The individual cells of the articulated sacs are of different length, either owing to the partial resorption of transverse walls, or to the elongation of individual cells, the latter at present appearing more probable, as phenomena indicating resorption could not be observed:—*Aleurites*, *Garcia*, and *Johannesia.*

4. Inarticulated (ramified) thick-walled laticiferous tubes, with peculiar apical growth, &c.:—*Hippomaneæ*, *Euphorbieæ*, and *Crotoneæ.*

It will be noticed that Dr. Pax has in no case observed articulated tubes in the sense of true vessels, such as I have found to occur in *Manihot* and *Hevea.* Only a *partial* absorption of the transverse walls is admitted as possible, but not probable, in the case of *Aleurites*, &c.

In the author's classification of the Order by anatomical characters (which corresponds with the morphological classification of Müller), the occurrence and character of the laticiferous tissue play an important part. I give the outlines of his arrangement, so far as it affects genera which have been referred to in my papers.

I. Phyllanthoideæ. (Laticiferous tubes absent.)

II. Crotonoideæ. (Laticiferous tubes or articulated sacs present.)

A. Acalyphineæ. (Laticiferous tubes articulated.) The *Heveæ* are doubtfully included in the fourth group of this division.

B. Hippomanoineæ. (Laticiferous tubes inarticulated.) This division includes, besides the *Crotoneæ* and *Euphorbieæ*, the *Hippomaneæ*, under which head, among other genera, *Hippomane*, *Hura*, *Jatropha*, and *Manihot* are enumerated.

This classification differs from that of Bentham as regards both the genera which have formed the special subject of my papers. First, *Hevea*, which is placed by Bentham in the subtribe *Jatropheæ* of his tribe *Crotoneæ*, is transferred by Dr. Pax (in agreement with Müller), though with an indication of doubt, to a group of the *Acalyphineæ*. The latter, as stated above, are mainly characterized in the anatomical classification of Dr. Pax by the "articulated" structure of their laticiferous tubes. It must, however, be remembered that his so-called articulated tubes are not vessels, but simply series of sacs of equal or of varying length, the walls of which, according to his observations, probably do not undergo absorption. Hence the inclusion of *Hevea* in this division does not seem to be very strongly supported by the anatomy of its laticiferous tissue; though the removal of the genus from the neighbourhood of *Jatropha*, which has quite typical inarticulated laticiferous cells, certainly seems to be demanded if anatomical characters have any real weight in classification. In support of Dr. Pax's view of the relationships of *Hevea*, it may be urged that a transition from a system of closed sacs to a network of true vessels is not difficult to comprehend; it has probably taken place both in the Papaveraceæ and Aroideæ, as will be further shown below. The difference between the two forms of tissue is quite comparable to that between tracheides and vessels; and this is regarded by nearly all anatomists as of secondary importance. Hence a near relationship between *Hevea* and the *Acalyphineæ* investigated by Dr. Pax, is at least not opposed by the respective characters of their laticiferous tissue.

A second point of difference between Dr. Pax's classification and that given in the 'Genera Plantarum' affects the position of the genus *Manihot*. This is placed in the latter work in the subtribe *Adrianeæ*. This arrangement is condemned by Dr. Pax, who speaks of the genus as having been "incorrectly severed by Bentham from the *Jatropheæ*."* Dr. Pax accordingly places *Manihot* next to *Jatropha* among his *Hippomaneæ*; and this is a tribe characterized in his arrangement by its inarticulated laticiferous tubes. It need hardly be said that my investigations here tend entirely to confirm Bentham's conclusion, which may indeed be regarded as a remarkable example of that instinct for affinities for which the greatest systematic botanists are distinguished. In the structure of its laticiferous system *Manihot* is as remote from *Jatropha* as one plant can be from another. If such anatomical characters are of any systematic importance at all (and Dr. Pax's whole work rests on the assumption that this is the case), the separation of *Manihot* from the *Jatropheæ* must be regarded as fully justified—quite as much so, in fact, as that of *Hevea*.

Dr. Pax is disposed to regard the form of laticiferous tissue which consists of a series of closed sacs (his "articulated tubes") as having given rise, in the phylogenetic development, to the inarticulated laticiferous cells, the transition having been effected through forms like *Johannesia*, where certain of the sacs grow to a great length*. His suggestion may be provisionally accepted; and I would further call attention to the still clearer relationship, already noticed, between the sacs and the true laticiferous *vessels*. Combining this view with that of Dr. Pax, we arrive at the conclusion that in the Euphorbiaceæ forms with closed laticiferous sacs have given rise, on the one hand, to those with typical laticiferous cells (e. g. *Euphorbia*), and, on the other hand, to those with true vessels, produced by cell-fusion (e. g. *Manihot, Hevea*). This conclusion appears well worthy of being tested by further observation. The Papaveraceæ afford an especially interesting series of cases, showing how the transition from the sacs to the vessels may have taken place†.

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* *L. c.* p. 410.

In *Sanguinaria* the characteristic red sap is contained in large sacs scattered through the parenchyma, which are either isolated or form continuous longitudinal series. In the root the sacs are roundish or shortly cylindrical; while in the stem and petiole they are elongated. Similar organs occur in *Glaucium, Macleya*, &c.

In *Chelidonium* we find these sacs replaced by vessels; but the transverse walls are partially persistent throughout life, and the vessels do not form a network. The members of these vessels show the same differences of form in stem and root as do the sacs in *Sanguinaria*.

Lastly, in *Papaver* the members of the vessels are completely fused, no trace of the transverse walls usually remaining, and are further laterally connected to form a complex reticulate system.

The Aroideæ contain an equally instructive series of forms, for which reference may be made to De Bary, *l. c.*

Such examples certainly appear calculated to throw great light on the mode in which laticiferous vessels first originated; and if, in the Euphorbiaceæ, we should also be able, in accordance with Dr. Pax's suggestion, to trace back the inarticulated laticiferous cells to their origin from secretory sacs, we should have reached the very interesting result that the two forms of laticiferous tissue, so different in their typical characteristics, have yet been derived by modification proceeding along two distinct lines, from originally similar histological elements.

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* *L. c.* p. 410.

† On the Papaveraceæ and Aroideæ, cf. De Bary, *l. c.* pp. 199, 435, & 436.

Supplementary Notes on *Restiaceæ*.

By MAXWELL T. MASTERS, M.D., F.R.S., F.L.S.

[Read 4th June, 1885.]

SINCE the publication of my Monograph of Restiaceæ in the first volume of A. de Candolle's 'Monographiæ Phanerogamarum,' issued in 1878, various additional collections have found their way into our herbaria. Comparatively few new species have been discovered among them; but the excellent specimens of Rehmann, and particularly of Bolus, frequently serve to extend or to complete our knowledge of particular species. The examination of more complete, and especially of more fully developed material thus supplied affords an opportunity for correcting errors of identification and synonymy. This is a matter of the more importance from the difficulty experienced in identifying particular specimens, and in satisfactorily pairing the male and female individuals of the same species.

The difficulties above alluded to are specially great in the two genera *Elegia* and *Dovea*, and they are enhanced by the fact that some of the early writers on these plants assumed, without sufficient warranty, that the particular species they were themselves examining were the same as those mentioned by their predecessors. Hence has arisen a conflict of statement and an entanglement of synonymy, which successive attempts to reconcile, or to unravel, have in many cases only served to intensify. Even when, as is the case in our own Society, we have the privilege of being able to consult Linnæus's own herbarium, to name only one instance, the difficulties are not always removed, for few of the specimens are absolutely authenticated by the Master himself, and most of them are so imperfect as to leave their identification still a matter of doubt. So difficult did I find it in one case to determine what the *Restio thyrsifer* of Rottböll really was, so varied were the opinions expressed upon it by those who had written about it without the opportunity of seeing it, that I went the length of suppressing the name. At that time I was not aware that Rottböll's specimens were in existence; but now, thanks to the courtesy of Prof. Lange, of Copenhagen, I have been enabled to examine the type specimen, and am in a position to testify to the general accuracy of the representation given by that botanist*. It is only an act of reparation to restore the species as Rottböll intended it. At the same time I have been enabled, as I think, to find a partner for the female plant, which alone was known to the Danish naturalist. The description of the species thus completed is given at a subsequent page.

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* Rottböll, 'Descript. et Icon. . . . Nov. Plant.' (1773), tab. iii. fig. 4.

The following notes comprise the description of certain new species detected by Bolus, Rehmann, and others, chiefly in the genera *Dovea* and *Elegia*, together with sundry modifications and adjustments which the examination of more perfect specimens has necessitated. I have also thought it useful to append:—1. A list of the specimens in the Linnean herbarium; and 2. Lists of the specimens collected by Bolus and Rehmann, and the numbers under which they have been distributed.

RESTIO.

? R. MULTIFLORUS, *Sprengel, Mast. in DC. Mon. Phanerog.* i. 279. (Plantæ masculæ patefactio.)

Of this species only the female plant has been hitherto described. With some hesitation I venture to describe a specimen in the herbarium of the British Museum, collected by Col. Bolton, as the male. The grounds for hesitation are threefold: first, there is not exact correspondence between the sexes; secondly, there is no direct evidence on the point; and, thirdly, the locality given, "Natal," is open to doubt. On the two first matters the difficulty is no greater than is met with in the Order generally; rarely, indeed, does it happen that the home-botanist can produce more than a strong probability in favour of his attempts at matching the sexes. The locality, Natal, is probably an error. In all probability this specimen and one or two others similarly labelled were collected at the Cape in the course of a journey to Natal. In any case there is no confirmation to be had of the occurrence of any Restiaceous plant in Natal. The general habit of Col. Bolton's specimen, the markings of the stem, the nature of the vaginæ, all correspond with those of the female plant of *R. multiflorus*, save that the membranous edges to the vaginæ are less deep. The many-flowered spikelets are arranged in much-branched spicate cymes, the branches ascending or slightly radiating. Each spikelet measures 4–5 mm., and when mature is somewhat pear-shaped; the bracts ovate-oblong, mucronate, slightly boat-shaped, and about the length of the ovoid subtriquetrous flower. The outer perianth-segments are brownish, cartilaginous, oblong obtuse, the lateral ones conduplicate, with a narrow glabrous keel; the three inner perianth-segments are one third shorter, all equal in size and form and membranous in texture. The anthers are oblong and destitute of mucro.

If this be really correctly referred, it is remarkable that it has not been met with before, for, while specimens of the female plant are to be found in most herbaria, this is, so far as I know, the only male plant in collections.

R. BIGEMINUS, *Nees*, *Mast. in DC. Mon. Phanerog.* i. 289. (Plant. masc. hactenus incognitæ descriptio.)

Among Rehmann's specimens in the herbarium of the British Museum is one (no. 1803) that is so obviously the male plant of *Restio bigeminus* (hitherto undescribed), that I have no hesitation in describing it as such, as follows:—

Culmi vaginæque ut in femineâ. Spiculæ masculæ paucæ in cymam patulam seu vix pendentem dispositæ, singulæ pedicellatæ 12–14 mm. longæ lineari-oblongæ acutæ plurifloræ. Bracteæ oblongæ acutæ subcoriaceæ fusco-purpureæ nitidiusculæ plurinervieæ quam flores brevius stipulati oblongo-acuti compressi dimidio longiores. Perianthii segmenta exteriora cartilaginea oblonga acutata, lateralia conduplicata, segmenta interiora conformia minora tenuiora; antheræ lineares apiculatæ.

Ad Prom. B. Sp. loco dicto, "Cape Flats," *Rehmann* 1803!

The bracts of both male and female plants have a peculiar lustrous metallic appearance.

DOVEA.

D. BOLUSI, *Mast.*, sp. n.; culmis simplicibus crassitie pennæ columbinæ; inflorescentia mascula spiciformi compacta; inflorescentia feminea conformi subæquilonga; spiculis subglobosis spathas subæquantibus vel superantibus; staminodiis nullis; ovario superne trilobato, lobis rotundatis carnosis flavis.

♃. Culmi cæspitosi ad basin vaginis arctis nigro-ferrugineis ut in congeneribus cincti, superne remote vaginati (vaginis deciduis), teretes olivacei subtilissime impresso-punctulati. Inflorescentia mascula spicatim-cymosa densa oblonga pluriflora 5 cm. longa. Spathæ seu bracteæ communes 10–12 cm. Flores appressi singuli bractea subcoriacea cymbiformi mucronata, flore

ipso breviore suffulti. Flores singuli 3 mm. longi oblongi arcuati. Perianthii segmenta externa subæqualia oblonga acuta naviculata; segmenta interiora conformia pallidiora externisque duplo longiora. Antheræ lineares apiculatæ perianthii segmentis internis vix breviores. Pistilli rudimentum minutum 3-lobum.—Inflorescentia feminea 3 cm. long. oblonga spicatim cymosa pluriflora. Spathæ oblongæ acutæ coriaceæ castaneæ nitidæ. Bracteæ seu spathellæ late ovatæ acutæ flores vix æquantes. Flores trigoni 4–5 mm. long. Perianthii segmenta externa ovata acuminata naviculata rigida ferruginea; segmenta interna externis paulo longiora latioraque, planiuscula. Staminodia nulla. Ovarium oblongum 3-gonum perianthii segmentis interioribus vix brevius, superne 3-lobum, lobis rotundatis carnosis flavidis, 3-loculare, loculis 1-ovulatis. Styli 3 subulati intus plumoso-stigmatosi.

Ad Prom. Bon. Sp. in monte dicto Muisenberg, prope Kalk Bay, *Bolus*, 3909 ♀ et 3910 ♂.

This species hardly differs in appearance from *D. ebracteata*, Kunth, but the female flowers differ, not only in their slightly larger size, but in the absence of staminodes, and particularly in the upper part of the ovary, which is 3-lobed, fleshy, and yellow. This fleshy portion is not merely the dilated base of the style, but a portion of the ovary itself, as may be seen on longitudinal section, the ovules being pendulous from the upper part of the cavities.

D. PANICULATA, *Mast.*, sp. n.; culmis simplicibus; inflorescentia mascula lineari-oblonga laxe paniculatim cymosa; spathis magnis apertis, spathellis minoribus lineari-lanceolatis longissime setaceo-aristatis albidis; spiculis 1-floris stipulatis; floribus trigonis; perianthii segmentis oblongo-acuminatis, interioribus fere duplo longioribus; antheris lineari-oblongis apiculatis; pistilli rudimento carente; inflorescentia feminea conformi breviore; perianthii segmentis subæqualibus externis valide recurvo-acuminatis; staminodiis nullis; ovario trilobo triloculari.

♃. Culmi 50–60 cm. crassitie pennæ gallinaceæ erecti solidi simplices teretes obsolete papulati fusco-olivacei, basi vaginis approximatis persistentibus coriaceis nitide-castaneis subulato-mucronatis sursum gradatim increscentibus obsiti. Vaginæ culmeæ superiores raræ arctæ deciduæ annulum nigrescentem basi tantum relinquentes. Inflorescentia mascula laxe paniculatim cymosa pluristachya lineari-oblonga 5–8 cm. long. spathis coriaceis pallide ferrugineis oblongo-acutis planis ramos cymæ dimidio superantibus. Spathellæ ad basin pedicellorum florigerorum lineari-lanceolatæ longiuscule acuminatæ albidæ laceræ flores dimidio superantes. Flores 5 mm. long. trigoni a spathella stipite brevi sublati. Perianthii segmenta externa naviculata oblongo-acuminata pergamenea castanea; segmenta interiora conformia latiora longioraque. Antheræ lineari-oblongæ apiculatæ perianthii segmentis bene breviores.—Inflorescentia feminea 4–6 cm. parce ramosa, oblonga compacta paucistachya, spathis spathellisque fere ut in mare. Perianthii segmenta cornea, exteriora ut in mare, interiora oblonga acuta exterioribus vix breviora. Ovarium oblongum obtusum 3-lobum 3-loculare, loculis 1-ovulatis, extus ad angulos eminentes costa pallide flava notatis. Stylus basi crassus ovario continuus mox in ramos subulatos intus plumoso-stigmatosos dividens. Fructus immaturus trigonus coriaceus secundum costas flavidas, ut videtur, demum dehiscens.

Ad Prom. B. Sp. In montes Drakensteen, prope Bainskloof inter 1600 et 2000 ped., leg. *Bolus*, 4082, 4098 ♂; 4097, 4081 ♀; *Burchell*, 8719 ♂.

D.? **RACEMOSA**; culmis compressiusculis cinereis leviter gyrososulcatis; inflorescentia mascula 14–16 cm. laxe paniculatim cymosa, cymis effusis pluriramosis pluristachyis; spathis cymæ ramos duplo superantibus latiuscule pallide limbatis; perianthii masculi segmentis oblongis obtusiusculis, externis quam interna brevioribus (ex spec. cl. Burchell, nn. 574 et 8007); inflorescentia feminea conformi; perianthii segmentis subæqualibus acutatis; ovario trilobo triloculari (ex ic. Lamarck).

Restio racemosus, *Lamarck, Ill.* t. 804. f. 4.—Dovea tectorum? *Mast.* olim quoad ♀.

♃. Culmi 70–90 cm. crassitie pennæ gallinaceæ simplices erecti solidi teretes vel parum compressi, minutissime impressopunctulati siccitate longitudinaliter sulcati basi vaginis approximatis spadiceis obsiti. Vaginæ culmeæ deciduæ. Inflorescentia mascula 15 cm. long. laxe paniculatim cymosa. Cymæ ramosæ pluriflorae, spathis late lanceolatis intus nitidis subpersistentibus dimidio breviores. Bracteæ seu spathellæ ultimæ floribus obtusiusculis breviores lanceolatæ. Perianthii segmenta membranacea ferruginea exteriora oblonga obtusa, interiora duplo longiora angustiora.—Inflorescentia feminea (ex icon. cl. Lamarck) mari conformis; perianthii segmenta omnia æqualia ovata acuta; ovarium trilobatum triloculare.

Ad Prom. Bon. Spei, ad montem tabularem, *Burchell*, 574 ♂, et ad Valley Rivier's Poort, 6999 ♂, ad montes Niewekloof, 8067 ♂; specimina olim a me ad *Elegiam propinquam* relata. *Dr. Thom*, 904 ♂; Witteklip, *MacOwan* 2050, *Drège* 1647.

The male plant corresponds very closely with Lamarck's figure of his *Restio racemosus*. The shape of the perianth-segments is different in the male and female plants respectively, as it frequently is in this genus and in *Elegia*. Burchell's specimens are all males, but they correspond so closely with the figure of Lamarck, above cited, that although I have not seen an authentic specimen of Lamarck's, I have little hesitation in combining the two. The broadly lanceolate open spathes, with a rather wide whitish edge, are characteristic of this species. The 3-lobed, 3-celled ovary of Lamarck's plant indicates it to belong to the genus *Dovea* as now constituted.

ELEGIA.

This genus is well characterized by its one-celled, indehiscent, usually 3-sided fruit, but in some species it is more or less terete or two-edged. The general habit is tolerably uniform throughout. The leaf-sheaths are usually deciduous, rarely persistent. There is considerable variation in the inflorescence, which, though always essentially cymose, varies from a close spike to a much-branched loose panicle. In the former case the bract and the "spathella" are one and the same; but when the inflorescence becomes much branched, the "spathella" occupies the position at the base of the ultimate pedicels, and the shortly stipitate flower is, in such cases, usually, but not universally, destitute of bract proper. When present it is of course of a different "order" from the spathella. In some of the species now described, the ovary, although uniformly 1-locular, is seen to be more or less 3-lobed, the lobes even being marked by wing-like processes, which appear to thicken as the fruit ripens, and then present the appearance of thickened ribs or costæ projecting from the prominent angles of the fruit.

E. GLAUCA, *Mast.*, sp. n.; culmo solido compresso; vaginis culmeis persistentibus; inflorescentia mascula brevi arcte compacta spathis oblongis persistentibus, inflorescentia ipsa haud longioribus; spathellis longe acuminatis; perianthii segmentis acuminatis; inflorescentia feminea oblonga; perianthii segmentis

subæqualibus obtusis mucronatis; fructu trigono exalato perianthio persistente vix breviore.

♃. Culmi cæspitosi alt. 60–70 cm. crassitie pennæ gallinaceæ ad basin squamis approximatis subcoriaceis castaneis sursum sensim increscentibus obtecti, superne compressiusculi solidi cinereo-grisei ruguloso-punctulati simplices vel parce ramosi. Vaginæ culmeæ persistentes 3 cm. long. laxe convolutæ coriaceæ ad margines membranaceæ. Inflorescentia mascula 2–3 cm. oblonga compacta spicatim cymosa spathis 1–2 cm. long. oblongis acutis planis persistentibus munita. Spathellæ spathis conformes minores longissime aristato-acuminatæ. Spiculæ plurifloræ. Flores 3 mm. long. trigoni arcuati. Perianthii segmenta omnia conformia naviculato-oblonga acuminata castanea exteriora quam interiora vix dimidio breviora. Antheræ lineari-oblongæ longiuscule apiculatæ.—Plantæ femineæ culmus vaginæque ut in mare. Inflorescentia oblonga 3–4 cm. long. spathis apertis lanceolatis prædita. Perianthii segmenta subæqualia membranacea oblonga obtusa mucronata. Fructus trigonus nitidus niger indehiscens, 1-locularis, stylis 3 deciduis superatus.

Ad Prom. Bon. Sp. ad Valley Rivier's Poort, *Burchell* n. 7105, ♂, specimen olim a me ad *E. junceam*, Linn., falso relatum. In montibus Hottentotshollandberg, prope Grietjesgat, *Bolus* n. 4221 ♀; *Rehmann*, 2564 ♀.

A species remarkable for its flattish stem and persistent culm-sheaths. Burchell, in his MS. note, calls it "Restio glaucus, insigniter glaucus teres cæspitosus tactu scaber, et culmi, lente visi, punctulis elevatis tecti."

E. ACUMINATA, *Mast.*, sp. nov.; culmo solido compressiusculo; vaginis laxis deciduis; inflorescentia mascula oblonga paniculatim cymosa densa, spathis apertis oblongo-lanceolatis intermixta; bracteis ovato-acuminatis floribus brevioribus; perianthii segmentis utriusque sexus acute mucronatis; fructu alato-costato.

♃. Culmi cæspitosi simplices 2–6 pedales teretes vel siccitate longitudinaliter sulcati cinerei obsolete puncticulati. Vaginæ ad basin culmi circumsecus arcte convolutæ coriaceæ castaneæ superne sensim increscentes, vaginæ superiores laxiores tenuiores mox deciduæ relicto annulo brunneo. Inflorescentia mascula 6–8 cm. dense paniculatim cymosa oblonga erecta pluriflora. Spathæ coriaceæ pallide ferrugineæ oblongo-lanceolatæ planæ 2–3 cm. long. Spathellæ longiuscule acuminatæ. Spiculæ oblongæ plurifloræ. Bracteæ spathellis conformes nisi minores.

Perianthii compressi arcuati segmenta exteriora oblongo-naviculata mucronulata castanea subæqualia, segmenta interiora duplo longiora oblonga acuta. Antheræ oblongæ apiculatæ.—Plantæ femineæ culmus vaginæque ut in mare. Perianthii cartilaginei castanei segmenta omnia æqualia conformia oblonga mucronata 2–3 mm. longa. Ovarium, seu fructus immaturus, ovoideo-trigonus ad angulos alato-costatus 1-locularis, stigmatibus tribus.

Ad Prom. Bon. Spei, ad Valley Rivier's Poort, *Burchell*, 6993, ♂ et ♀; ad Zwellendam, *Burchell*, 7435 ♂; *Bolus*, 4640 ♂ et ♀. *Verreaux in Herb. Mus. Brit.* spec. immatur. *Dr. Thom in Herb. Kew.* ♀; *Drège*, 104 ♂.

I had previously referred Burchell's specimens above cited to *E. juncea* of Linn.; but the fuller examination I have now been able to make, induces me to separate them as a distinct species, to which also the specimens of Bolus above cited may be referred.

E. MEMBRANACEA, *Mast.*; culmo solido tereti simplici obsolete puncticulato; vaginis deciduis; inflorescentia mascula 4–5 cm. oblonga compacta paniculatim cymosa, spathis apertis oblongo-lanceolatis planis chartaceis commixta, spathellis lanceolatis acuminatis; spiculis plurifloris; perianthii teretis recti segmentis exterioribus ovatis acutis vix mucronatis, segmentis interioribus conformibus duplo longioribus; antheris oblongis apiculatis; inflorescentia feminea cuneiformi; perianthii segmentis æqualibus mucronulatis; fructu pyriformi trigono exalato.

Restio membranaceus, quoad masc. *Nees in Linnæa*, v. p. 658.

♃. Culmi 2–3 pedales cæspitosi basi vaginis castaneis coriaceis approximatis vestiti, superne teretes olivacei minutissime albido-lepidoti, crassitie pennæ gallinaceæ. Vaginæ culmeæ deciduæ relicto annulo fusco. Inflorescentia mascula lineari-oblonga erecta. Spathæ chartaceo-membranaceæ. Flores feminei 3 mm. long. Perianthii segmenta omnia conformia oblonga acuta mucronulata ferruginea. Fructus pyriformi-obovoideus trigonus nitide niger exalatus 1-locularis, perianthio persistente vix brevior.

Ad Prom. B. Spei, ad montem tabularem, *Ecklon*, 836, pro parte, ♂; *Burchell*, 564, ♂ et ♀, specimina olim a me ad *E. junceam*, Linn., vitiose relata; *Drège*, 2520 ♂; *Zeyher*, ♂; *Harvey*, 200 ♂.

Nees von Esenbeck described the male plant only, which I referred to *E. juncea*, Linn. Some of Burchell's specimens, however, are females, a fact I had previously overlooked. The examination now made induces me to restore Nees's plant and to complete its description by adding the chief marks of the female plant. In general appearance it greatly resembles *E. propinqua*, Kunth, but differs in the acute, not rounded, perianth-segments.

E. PROPINQUA, *Kunth*, *Enum.* iii. p. 473, char. emend.; rhizomate repente; culmo solido simplici seu ad ramos verticillatim ramoso; vaginis culmeis oblongis obtusis demum deciduis; inflorescentia mascula 4–5 cm. long. oblonga paniculatim cymosa densa; spathis 2 cm. long. ovato-oblongis apertis; perianthii segmentis obtusiusculis; inflorescentia feminea oblonga spiciformi 3 cm. long., bracteis naviculatis floribus brevioribus.

Restio propinquus *Nees in Linnæa*, v. p. 653.—Elegia propinqua, *Mast. in De Candolle, Mon. Phanerog.* i. p. 356, aliqua ex parte.

♃. Rhizoma procurrens (in exemplo masculo a cl. Mac Owan nec non in specimine femineo cl. Bolus lecto observato). Culmi ascendentes simplices 60–80 cm. crassitie pennæ columbinæ olivaceo-cinerei, leviter gyroso-sulcati albido-lepidoti. Vaginæ 2–2½ cm. subpersistentes laxe convolutæ oblongæ coriaceæ ferrugineæ sub apice obtuso mucronulatæ, demum deciduæ annulum nigrescentem relinquentes. Inflorescentia mascula 4–5 cm. long. oblonga dense paniculatim cymosa, spathis ellipticis vaginiformibus apertis suffulti. Flores ovoidei sub 2 mm. long. stipulati, bractea seu spathella ovata obtusa parum longiores. Perianthii segmenta externa oblonga obtusa, segmenta interiora dimidio longiora oblonga. Antheræ apiculatæ. Inflorescentia feminea spicatim cymosa oblonga 3 cm. longa. Spathæ oblongo-lanceolatæ apertæ 2–2½ cm. long. Spathellæ naviculatæ floribus oblongis subcompressis dimidio breviores. Perianthii segmenta omnia æqualia circa 2 mm. long. conformia oblonga. Ovarium segmenta æquans subtrigonum nitidum nigrum impresso-punctulatum, 1-loculare, 1-spermum stylis tribus superatum.

Ad Prom. B. Spei, *Ecklon et Zeyher* 56, 5 ♂; *Burchell* 8066 ♂; 7492, 7710 ♀; *Dr. Thom* 1023 ♀; in clivis orient. mont. Diabol, *Bolus* 4457, et prope Bainskloof, 4087 ♀; ad Witteklip, *Mac Owan*, 2152 ♀.

Forma minor——*Burchell* 822 ♂; *Rehmann*, in montibus supra Worcester, 2565, 2570.

A species nearly allied both to *Elegia juncea* and to *Elegia membranacea*. From the former it differs in its much shorter inflorescence, shorter flatter spathes, and more rounded perianth-segments. From *E. membranacea* it differs in the broader shorter spathes, the cuspidate spathellæ, and the acute perianth-segments. The absence of ribs or wings to the fruit separates it from *E. acuminata* and *E. thyrsifera.*

E. EQUISETACEA, *Mast.*; culmis teretibus crassitie pennæ gallinaceæ simplicibus vel ad nodis verticillatim ramulosis; vaginis laxe convolutis; inflorescentia lineari-oblonga; spathis ovato-lanceolatis acuminatis ramos cymæ superantibus; floribus masculis ovoideo-oblongis; perianthii segmentis lineari-oblongis; fructu ovoideo-triquetro.

E. propinqua, *Kunth*, *β.* equisetacea, *Mast. l. c.* p. 357.

♃. Culmi 60–70 cm. teretes cinereo-olivacei impresso-punctulati. Vaginæ infimæ deciduæ superiores ad 3 cm. longæ laxe convolutæ ferrugineæ intus nitidæ. Inflorescentia mascula ad 10 cm. lineari-oblonga laxe paniculatim cymosa pluriflora. Spathæ circa 3 cm. long. 1 cm. lat. planæ ovato-lanceolatæ intus nitentes. Spathellæ seu bracteæ floribus vix breviores ovatæ acuminatæ. Perianthii sub 2 mm. long., segmenta lineari-oblonga, externa quam interna dimidio minora. Antheræ apiculatæ.—Plantæ femineæ culmi ad vaginas verticillatim ramulosi, ramulis densis erectis; vaginis parvis foliaceo-mucronatis. Inflorescentia lineari-oblonga subspicatim cymosa. Flores triquetri. Perianthii segmenta subæqualia lineari-oblonga. Fructus ovoideo-triqueter perianthio persistente æquilongus 1-locularis 1-spermus.

Ad Cap. B. Spei, *Drège*, 103, 367 ♂; *Ecklon et Zeyher*, ♂ et ♀; *Burchell*, Zwellendam, 7429 ♀.

E. JUNCEA, *Linn.*, char. emend.; culmo solido tereti; vaginis deciduis; inflorescentia mascula lineari-oblonga, densa 7–8 usque ad 20 cm. long., laxe paniculatim cymosa spathis oblongo-lanceolatis apertis vel convolutis 3 cm. long. commixta; spathellis oblongis longiuscule acuminatis; perianthii subteretis recti segmentis exterioribus oblongis obtusis; segmentis interioribus conformibus subduplo longioribus; antheris oblongis apiculatis (spec. in herb. Linn. asserv.); inflorescentia feminea 7–8 cm. long. oblonga; spathis oblongis acutis appressis; bracteis obtusis; perianthii segmentis lineari-oblongis obtusis æqualibus; fructu perianthio æquilongo lineari-oblongo trigono nitido nigro exalato 1-loculari (femin. juxta spec. Bolusii (n. 4457), descript.).

Elegia juncea, *Linn. Mant.* 1771! p. 297; *Kunth, Nees, Masters* et *auctt. var.* omnes aliqua ex parte, synonymisque excludendis.—Restio Elegia, *Linn. Syst. Veg.* ed. 14, p. 882!—Restio thyrsifer, *Lam. Ill.* 804, f. 3 ♀ (fide icon. *Lam.*), *nec Rottböll.*

♃. Culmi erecti solidi 3–4 ped. alt., crassitie pennæ gallinaceæ, teretes vel compressiusculi obsolete puncticulati siccitate leviter gyroso-sulcati. Vaginæ culmeæ deciduæ relicto annulo truncato. Inflorescentia mascula 7–8 (usque ad 20) cm. long. lineari-oblonga compacta paniculatim cymosa pluriflora. Spathæ oblongæ vel oblongo-lanceolatæ planæ vel convolutæ subcoriaceæ ad margines tenuiores, papulosæ intus albido-nitentes. Spathellæ ad basin ramorum cymæ oblongo-lanceolatæ acuminatæ, ramos haud superantes; spathellæ ultimæ ordinis seu bracteæ oblongæ obtusæ floribus rotundatis vix breviores. Perianthii segmenta externa oblonga obtusa castanea segmenta interiora conformia duplo longiora; antheræ lineari-oblongæ apiculatæ.

Inter plantas Linneanas adsunt specimina quædam quibus inflorescentia valde elongata angustior, spathis minus apertis, spathellisque plus solito evolutis. Plantæ femineæ culmus ut in mare. Inflorescentia lineari-oblonga spathis subdistichis arcte convolutis spathellisque brevibus. Spathellæ ultimæ seu bracteæ oblongæ obtusæ floribus vix breviores. Perianthii oblongi teretis segmenta lineari-oblonga obtusiuscula omnia subæqualia. Fructus lineari-clavatus trigonus perianthio æquilongus, nitide niger, 1-locularis.

Descriptio maris e speciminibus Linneanis desumpta, femineæ ex exemplariis a cl. Bolus lectis (n. 4457).

In clivis orientalibus montis Diaboli prope Cape Town, *R. Brown* ♂; *Bolus* 2884, 4456 ♂, 4457 ♀; *Bowie* ♂; *Drège* 103, 367 ♂; *Sieber* 229 ♀; *McGillivray* 432 ♂; *Harvey* 389 ♂; *Dr. Thom* 892 ♂; prope Cape Town, *Rehmann* 1455 ♂; *Zeyher* 4340; *Burchell* 8132 ♀.

The synonymy of this species is almost hopelessly entangled in books, mainly because authors have not been enabled to consult the authentic specimens of Linnæus, Thunberg, Rottböll, and Lamarck. Each author in turn has guessed at the meaning of his predecessor. The earlier descriptions, moreover, are very incomplete, and without actual comparison do not allow of the matching of male and female specimens. From *E. propinqua*, *E. juncea* may be known principally by its much longer inflorescence, and very obtuse or rounded perianth-segments (in the male).

E. THYRSIFERA, *Persoon*, char. emend.; culmo compresso fistulato simplici; inflorescentia feminea 3–4 cm. ovali dense paniculatim ramosa, spathis apertis oblongo-lanceolatis munita; spathellis minoribus lanceolatis longiuscule acuminatis; floribus compressiusculis; perianthii segmentis omnibus lanceolatis acuminatis subæqualibus; fructu oblongo obtuso trialato 1-loculari.

Restio thyrsifer, *Rottböll, Progr.* 1772, p. 11, *et Descript. et Icon. Rar. . . . et Nov. Plant.* (1773), p. 8, tab. iii. fig. 4.—Elegia thyrsifera, *Persoon, Synops.* ii. p. 607, excl. syn.

♃. Culmus erectus compressiusculus subulatus olivaceus impresso-punctulatus siccitate leviter gyroso-sulcatus, crassitie pennæ gallinaceæ. Vaginæ deciduæ cicatrices annuliformes relinquentes, in plant. masc. vaginæ diu persistentes 3–4 cm. long. laxe convolutæ castaneæ intus albido-nitentes. Inflorescentia mascula (ex spec. Masson) 5–6 cm. oblonga dense paniculatim cymosa. Spathæ oblongæ apertæ limbatæ 2–3 cm. long., 10–14 mm. lat. Flores ovoidei sub 2 mm. long. bractea suborbiculari-naviculata flore dimidio breviore stipati. Perianthii segmenta exteriora oblonga obtusiuscula ferruginea glabra, segmenta interiora dimidio longiora conformia. Antheræ apiculatæ. Inflorescentia feminea 3–4 cm. long. compacta ovoidea, paniculatim cymosa. Spathæ oblongo-ovatæ apertæ coriaceæ fuscæ maculis purpureis irroratæ 2 cm. long. 1 cm. lat. Spathellæ multo minores lanceolatæ longiuscule acuminatæ, ramos ultimos cymæ vix superantes. Flores 4–5 mm. long., parum compressi haud arcuati. Perianthii segmenta subcoriacea ferruginea lanceolata omnia conformia, interiora tenuiora vix breviora. Fructus oblongus obtusus longitudinaliter 3-alatus 1-locularis 1-spermus, perianthio persistente tertia vel quarta parte longior.

Descriptio e specimine femineo Rottbölliano mihi benevole a cl. Lange communicato desumpta, et quoad marem ex exemplo a cl. Masson lecto et in herb. Mus. Brit. asservato.

The synonymy of this species is extremely involved, for reasons already mentioned. The examination of one of Rottböll's specimens, kindly lent for the purpose by Prof. Lange of Copenhagen, shows how faithfully executed was the drawing in the book above cited. I am, however, quite unable to refer the specimen to any other known species; but I have little hesitation in referring a male specimen collected by Masson to the same species. The three wings to the ovary, a character it possesses in common with *E. acuminata*, are very remarkable.

E. COLEURA, *Nees, ex Mast. in Mon. Phaner.* i. p. 358, char. ampliat.; rhizomate procurrente; culmis simplicibus complanatis; vaginis laxiusculis subpersistentibus inflorescentia oblonga paniculatim cymosa; bracteis ovatis acuminatis; floribus subtriquetris asperulatis; fructu ovoideo-triquetro.

♃. Rhizoma crassiusculum repens. Culmi 70–80 cm. erecti, crassitie pennæ gallinaceæ, compressiusculi cinereo-olivacei minutissime albido-maculati, basi vaginis arctis coriaceis ellipticis approximatis obtecti. Vaginæ culmeæ 3–4 cm. laxe tubulatæ coriaceæ superne acutatæ patentes ad margines tenuiores. Inflorescentia mascula oblonga 4–6 cm. dense paniculatim cymosa. Spathæ coriaceæ pallide ferrugineæ ovato-lanceolatæ apertæ ramos paniculæ superantes. Bracteæ ovatæ sub apice acuto mucronatæ floribus vix breviores. Flores subtriquetri. Perianthii segmenta oblonga acutiuscula asperulata, externa quam interna dimidio breviora. Antheræ apiculatæ. Plantæ femineæ ut videtur minus robustæ, rhizoma procurrens; inflorescentia lineari-oblonga 2–3 cm. longa spicatim vel subpaniculatim cymosa, rami pauci erecti spathis convolutis vaginiformibus paulo breviores. Flores ovoidei 2 cm. long. Perianthii segmenta subæqualia ovata mucronata ferruginea asperulata. Ovarium ovoideo-trigonum 1-loculare 1-ovulatum. Styli 2 (? 3).

Ad Prom. Bon. Spei, Tulbagh, *Ecklon et Zeyher*, 78, 8 ♂; *Drège*, 571, 1638, et 1648 ♂; *Burchell*, 168, 571, ad montes prope Worcester; *Rehmann*, 2571 ♀.

A species remarkable for its flattened stems, persistent sheaths, with a tendency to recurve at the tips, and slightly rough perianth-segments. Rehmann's specimens allow of a complete description being drawn up, the specimens from other collections being male only. The species, if all of the above-quoted specimens really belong here, varies considerably in stature. From some forms of *E. parviflora*, which it much resembles, it differs in the creeping, not tufted, rhizome.

E. VAGINULATA, *Mast.*, sp. nov.; culmo simplici, alt. 18–20 cm. solido; vaginis laxis brevibus mox deciduis; inflorescentia spiciformi brevi (1 cm.); pedunculis spathis apertis brevioribus; fructu tereti 1- (vel 2-?) loculari indehiscente.

♃. Culmi cæspitosi, basi spatio brevi vaginis arcte tubulatis brevibus cincti, superne ascendentes curvati teretes solidi viridescenti-olivacei, siccitate leviter gyroso-sulcati. Vaginæ culmeæ 5–8 mm. ovato-oblongæ acutæ coriaceæ ferrugineæ, intus nitentes, cito deciduæ annulum nigrescentem relinquentes. Inflorescentia mascula femineaque conformis e cyma brevi spiciformi constans. Spathæ vaginæformes apertæ ramos inflorescentiæ superantes. Spathellæ ovatæ obtusæ flores vix æquantes. Flores masculi sub 2 mm. long. trigoni sessiles. Perianthii segmenta externa breviora oblonga acuta naviculata castanea, segmenta interiora longiora latioraque. Antheræ breves apiculatæ. Flores feminei quam mares paulo longiores. Perianthii segmenta subæqualia oblonga acuta, externa lateralia conduplicata subcarinata. Ovarium cupuliforme læve stylis 3 superatum, 1-loculare, 1-spermum.

Ad Cap. Bon. Spei, *Burchell* 7141 ♂, prope Bainskloof; *Bolus*, n. 4100 ♀.

E. RIGIDA, *Mast.*, sp. n.; culmis simplicibus gracilibus teretibus; inflorescentia feminea lineari-oblonga; ramis cymæ spiciformis spathis convolutis omnino amictis; fructu trigono.

♃. Culmi dense cæspitosi basi vaginis arcte tubulatis approximatis coriaceis castaneis circumvoluti, superne teretes 30–40 cm. alt., crassitie pennæ passerinæ olivacei impresso-punctulati maculisque parvis purpureis obsiti. Vaginæ culmeæ raræ cito deciduæ annulum angustum relinquentes. Inflorescentia 2 cm. long. lineari-oblonga erecta. Spathæ distichæ arcte convolutæ membranaceæ pallide fuscæ ramos breves erectos cymæ spiciformis omnino velantes. Perianthium vix 2 mm. long. Segmenta subæqualia lateralia externa conduplicata acuminata, intermedia planiuscula subspatulata. Ovarium trigonum nitidum 1-loculare perianthio persistente æquilongum. Styli 3 recurvi. Planta mascula adhuc ignota.

In mont. Drakensteen, prope Bainskloof, *Bolus*, 4100 ♀!

E. STIPULARIS, *Mast.*, sp. n.; culmis cæspitosis teretibus superne ramosis; vaginis diu persistentibus ovato-lanceolatis; inflorescentia mascula elongata dense paniculatim cymosa; perianthii segmentis oblongis obtusis; inflorescentia feminea conformi; perianthii segmentis acutiusculis; staminodiis parvis; fructu triquetro.

Restio stipularis, *Banks, MSS. in herb. Mus. Brit.*

♃. Culmi cæspitosi 50–60 cm., ad basin, spatio brevi, vaginis ovatis convolutis purpurascentibus sursum increscentibus circumdati, erecti teretes cinerei purpureo-maculati, crassitie pennæ columbinæ, medium versus ramosi, ramis gracilibus erectis. Vaginæ culmeæ diu persistentes, 15–18 mm. long., 6–7 mm. lat., ovato-lanceolatæ subcoriaceæ fuscæ purpureo-maculatæ, ad margines tenuiores intusque albido-nitentes. Inflorescentia mascula 5–8 cm. lineari-oblonga erecta, e cymis densis paniculatis plurifloris spathis vaginiformibus mixtis constans. Flores subteretes, sub 2 mm. long. Perianthii segmenta oblonga obtusa, exteriora quam interiora dimidio breviora. Antheræ apiculatæ. Plantæ femineæ culmus, vaginæ et inflorescentia ut in mare, ramis autem magis patulis. Perianthii segmenta subæqualia acuta. Staminodia 3, parva liguliformia. Fructus ovoideo-triqueter, 1-loc., 1-sperm., stylis tribus coronatus.

Ad Prom. Bon. Spei, *Masson in herb Mus. Brit.* ♂; *R. Brown, Iter Austral.* ♂; ad "Olifant's Bay," *Gill in herb. Kew.* ♂, *Verreaux* sine numero. *Burchell* 6290 ♀.

Species in herbariis sæpissime cum *E. parviflora* confusa, vaginis autem subpersistentibus apertis, intus albido-nitentibus, facile internoscenda.

E. SPATHACEA, *Mast.*, sp. n.; culmis cæspitosis gracilibus; vaginis deciduis; inflorescentia mascula tam quam feminea oblonga (4 cm. long.) laxiuscule ramosissima; spathis planis apertis oblongis acutis; fructu triquetro.

♃. Culmi 40–50 cm., dense cæspitosi, basi vaginis subcoriaceis ferrugineis dense obsiti, superne teretes, crassitie pennæ columbinæ, cinereo-viridescentes purpureo-maculati, leviter gyroso-sulcati. Vaginæ culmeæ deciduæ annulum nigrescentem tantum relinquentes. Inflorescentia mascula 4 cm. et ultra paniculatim cymosa pluriflora. Spathæ coriaceæ fuscæ scrobiculatæ oblongæ acutæ, ramos cymæ vix superantes. Flores vix ultra 1 mm. long., subtriquetri. Perianthii segmenta oblonga obtusa, externa quam interna dimidio breviora. Inflorescentia feminea masculinæ conformis minus ramosa, ramis cymæ spathis brevioribus. Flores sub 2 mm. long. Perianthii segmenta omnia subæqualia obtusa castanea. Fructus perianthio persistente æquilongus, clavato-triqueter, 1-locularis, 1-sperm.

Ad Cap. Bon. Spei, *Burchell* 7710 ♂; ejusdem 7959 ♀.

E. FILACEA, *Mast.*, sp. n.; culmis cæspitosis erectis simplicibus tenuissimis rigidis; vaginis arcte tubulatis acutis diu persistentibus; inflorescentia mascula femineaque conformi, brevi oblonga; spathis ovatis acuminatis apertis ramos cymæ excedentibus; fructu triquetro.

♃. Culmi 30–40 cm., crassitie pennæ passerinæ, cinereo-viridescentes purpureo-maculati, siccitate leviter gyroso-sulcati. Vaginæ culmeæ 12–15 cm., arcte tubulatæ coriaceæ ferrugineæ, superne sensim angustatæ longiusculeque acuminatæ acumine appresso. Inflorescentia 2 cm. long., terminalis erecta lineari-oblonga, densiuscule paniculatim cymosa. Spathæ vaginiformes planæ apertæ, ramos paniculæ superantes. Flores numerosissimi, minuti. Perianthii masculi 1 mm. long., subrotundi, segmenta externa oblonga obtusa, segmenta interna paullo longiora oblonga. Antheræ apiculatæ. Perianthii feminei 1 mm. long., segmenta omnia subæqualia oblonga cymbiformia, 1-nervia. Fructus perianthio persistente æqualis, triqueter 1-locularis, 1-spermus.

Ad Cap. Bon. Spei, *Drège*, n. 110 ♂; n. 126 (flor. juvenil.); *Burchell*, 8121 ♀.

A species of very rigid wiry appearance, much resembling *E. parviflora*, but with persistent sheaths.

E. VERREAUXII, *Mast.*, sp. n.; rhizomate horizontali procurrente; culmis simplicibus; vaginis subpersistentibus mucronatis; inflorescentia terminali simplici; spicula solitaria pluriflora; bracteis mucronatis; perianthii segmentis oblongis obtusis; fructu clavato-trigono.

♃. Rhizoma procurrens. Culmi erecti, ad 15 cm., graciles, simplices, crassitie pennæ passerinæ, grossiuscule gyroso-sulcati. Vaginæ 1 cm. long., coriaceæ brunneæ mucronatæ. Inflorescentia 8–10 mm. long., ovoidea, terminalis pluriflora. Bracteæ vaginiformes. Flores 1 mm. long. Perianthii segmenta omnia castanea subæqualia oblonga obtusiuscula, fructum æquantia. Fructus trigono-clavatus, nigrescens, indehiscens, 1-loc., 1-sperm.

Ad Prom. B. Sp., *Verreaux in herb. Mus. Brit.* Planta feminea tantum nota.

SCLEROCHÆTIUM THERMALE, *Nees, Kunth, Enum.* ii. p. 321, nomen delendum.

In Shuttleworth's herbarium, in the British Museum, is a sterile branch of a species of *Thamnochortus* (Sieber 231). The syno-

nym of "*Lepidospermum thermale*, Nees," is also attached to this specimen. Bentham (Gen. Plant. iii. 1064) refers Nees's *Sclerochætium* to *Elynanthus* in Cyperaceæ. *Lepidosperma* is also Cyperaceous.

RESTIACEARUM IN HERB. LINNÆI ASSERVATARUM CATALOGUS.

Nomina e schedulis transcripta hic inter virgulos " " interjecta.

1. "Restio paniculatus" = Hypolæna Eckloniana, *Mast.* ♂.
2. "Restio verticillaris" = Elegia verticillaris, *Kunth.*
3. "Schœnus capensis" = Restio cuspidatus, *Thunb.*
4. "Schœnus capensis"—"female"—"dichotomus," *Thunb.*: on the back of the sheet "Equisetum junceum nigrinodum, Capitis B. Spei, *Breyn. Cent.* t. 91; *Pluk. Phyt.* 317. f. 3," = Restio bifidus, *Thunb.*
5. "dichotomus" = Restio vaginatus, *Thunb.*
6. "dichotomus" = Restio cuspidatus, *Thunb.*
7. "paniculatus, dichotomus," = Leptocarpus paniculatus, *Mast.*: on reverse Restio paniculatus, *Fris.* t. 1. f. 2 (= *Rottböll*).
8. "dichotomus"—"vimineus," = R. dichotomus, *Rottb.*: on reverse Restio dichotomus, *Fris.* [*Rottböll*] t. 1. f. 1.
9. "vimineus:" on reverse *Fris.* t. 1. f. 1. This does not correspond with Rottböll's figure, but is referable to *Thamnochortus distichus*, Mast.
10. "Restio triflorus, C. B. S.:" on reverse Restio vimineus, *Fris.* t. 2. f. 1 = Restio triflorus, *Rottb.*
11. "T. 457, simplex," = Staberoha, sp.
12. "C. B. S. Elegia": on reverse "Fris. t. 3. f. 4." This does not correspond with Rottböll's figure, but is *Willdenovia Lucæana*, Kunth.
13. "Elegia." Of the three specimens on this sheet, that to the left is *Elegia deusta*, Kunth, that in the centre *Dovea tectorum*, Mast., and that to the right *D. mucronata*, Mast.
14. "Elegia:" on the reverse "Chondropetalum deustum, *Fris.* t. 3. f. 2," = Elegia deusta, *Kunth.*
15. "T. 528, tectorum," = Dovea tectorum, *Mast.*
16. "Cap. 51" (identified as "tectorum" by Sir James E. Smith), "eo tecta conficiuntur:" on the reverse "Restio thyrsoides, *Fris.* 3. t. 3. f. 4." The specimen does not correspond with Rottböll's plate, but is referable to *Dovea tectorum*, Mast.

17. On the reverse "Elegia juncea."
18. Unnamed,=Juncacea?
19. Unnamed: on the reverse "Restio vimineus," but not of Rottböll. It is *Hypolæna* sp.
20. On the reverse "Restio triflorus,"=Restio vaginatus, *Thunb.*
21. "T. 518,"=Hypodiscus albo-aristatus, *Mast.*
22. "T. 457,"=Thamnochortus spicigerus, *R. Br.*, ♀.
23. "Restio,"=barren stem of some *Thamnochortus.*
24. Unnamed,=Cyperacea.
25. "T. 369,"=Thamnochortus spicigerus, *R. Br.*, ♀.
26. "Restio"=Restio bifidus, *Thunb.*?

The letter T probably refers to Thunberg, the specimens in whose herbarium were enumerated by me in the fourteenth volume of the Journal of the Society, p. 413.

SPECIMINUM A CL. BOLUS LECTORUM ENUMERATIO.

The following determinations refer to the species collected by Bolus:—

1509. Van Stadensberg, Uitenhage, = Thamnochortus argenteus, *Kunth.*
2584. In summo monte Konveld, Sneeubergen, = Restio Sieberi, *Kunth*, ♀.
2663. Ex parte, = R. laniger, *Kunth.*
2878. Ad montem Tabularem, = Dovea mucronata, *Mast.*, ♂.
2880. Prope fluvium Breede, = Thamnochortus imbricatus, *Mast.*, ♂ et ♀.
2881. Prope Urbem Cap.,=Thamnochortus cernuus, *Kunth*, ♂.
2882. " " " =Thamnochortus dichotomus, *R. Br.*, ♂.
2883. Ad mont. Tabular., = Thamnochortus elongatus, *Mast.*, ♂ et ♀.
2885. Ad mont. Tabular., = Restio cuspidatus, *Thunb.*
2887. Ad urbem Cap., = R. filiformis, *Poiret.*
2888. " " " = R. quinquefarius, *Nees.*
3903. Ad Wynberg, = Elegia fistulosa, *Kunth.*
3909, 3910. Ad Muisenberg, = Dovea Bolusii, *Mast.*, ♂ et ♀.
4049. In Drakensteenberg ad Bainskloof, = Restio fraternus, *Kunth*, ♂ et ♀.
4080. In Drakensteenberg ad Bainskloof, = Cannamois virgata, *Steudel.*

4083. In Drakensteenberg ad Bainskloof, = Restio subfalcatus, *Nees*.

4084. In Drakensteenberg ad Bainskloof, = R. subverticillatus, *Mast.*, ♂.

4085. In Drakensteenberg ad Bainskloof, = Willdenovia Lucæana, *Kunth*, forma monstrosa.

4088. In Drakensteenberg ad Bainskloof, = Cannamois virgata, *Steudel*, ♂ et ♀.

4090. In Drakensteenberg ad Bainskloof, = Restio Sieberi, *Kunth*.

4090 B. „ „ „ „ = R. scoparius, *Kunth*.

4091. „ „ „ „ = Thamnochortus dichotomus, *Kunth*, ♀.

4093. In Drakensteenberg ad Bainskloof, = Restio pachystachyus, *Kunth*.

4094. In Drakensteenberg ad Bainskloof, = Willdenovia Lucæana, *Kunth*.

4095. In Drakensteenberg ad Bainskloof, = Restio perplexus, *Kunth*, var.

4096. In Drakensteenberg ad Bainskloof, = R. Gaudichaudianus, *Kunth*.

4100. In Drakensteenberg ad Bainskloof, = Elegia rigida, *Mast.*, ♂ et ♀.

4101. In Drakensteenberg ad Bainskloof, = E. verticillaris, *Kunth*, ♂.

4102. In Drakensteenberg ad Bainskloof, = Thamnochortus elongatus, *Mast.*, ♂ et ♀.

4103. In Drakensteenberg ad Bainskloof, = T. cernuus, *Kunth*, ♂.

4104. „ „ „ „ = Restio scoparius, *Kunth*, ♂ et ♀.

4105. In Drakensteenberg ad Bainskloof, = Thamnochortus dichotomus, *R. Br.*, ♂.

4106. In Drakensteenberg ad Bainskloof, = Hypodiscus aristatus, *Nees*, ♂.

4107. In Drakensteenberg ad Bainskloof, = Restio Gaudichaudianus, *Kunth*, ♀.

4221. In Drakensteenberg ad Bainskloof, = Elegia glauca, *Mast.*, ♂ et ♀.

4222. Ad Hottentots hollandberg, = Hypodiscus Oliverianus, *Mast*.

4223. Palmiet Valley, = Elegia asperiflora, *Kunth*.

4234, 4235. Hex Rivier, = Restio elatus, *Mast*.

4236. Groenekloof, = Thamnochortus erectus, *Mast.*

4326 *bis.* „ = T. spicigerus, *R. Br.*

4237. „ = T. Burchellii, *Mast.*, ♂.

4238. „ = T. imbricatus, *Mast.*, ♀.

4239. „ = T. umbellatus, *Kunth*, ♂.

4240. „ = Cannamois simplex, *Kunth.*

4243. Piquenier's Kloof, flum. Olifant, = Dovea macrocarpa, *Kunth*, ♀.

4430. Prope Cape Town, = Thamnochortus imbricatus, *Mast.*

4431. Cape Flats, = T. dichotomus, *R. Br.*

4432. „ = Elegia parviflora, *Kunth.*

4433. „ = Restio Eleocharis, *Mast.*, ♂.

4434. „ = Thamnochortus distichus, *Mast.*, ♂.

4435. „ = Willdenovia striata, *Thunb.*, ♂.

4436. „ = Thamnochortus dichotomus, *R. Br.*, ♂.

4437. Table Mountain, = Restio compressus, *Rottböll*, ♀.

4439, 4440. Table Mountain, = R. bifidus, *Thunb.*, ♀.

4441. Prope Cape Town, = Lamprocaulos Neesii, *Mast.*, ♂.

4442. „ „ = Restio multiflorus, *Sprengel.*

4444. „ „ = Elegia deusta, *Kunth.*

4445. Table Mountain, = Dovea ebracteata, *Kunth*, ♀.

4446. Muisenberg, = Hypolæna Eckloniana, *Mast.*

4446 (2). Cape Flats, = Thamnochortus spicigerus, *R. Br.*

4446 (3). „ = T. erectus, *Mast.*

4447. In Mont. Diabol., = Hypodiscus albo-aristatus, *Mast.*

4448. Cape Flats, = Restio bigeminus, *Nees*, ♀.

4449. „ = Thamnochortus Burchelli, *Mast.*, ♂.

4450. „ = T. spicigerus, *R. Br.*

4451. „ = T. imbricatus, *Mast.*, ♀.

4452. „ = Restio furcatus, *Nees*, ♀.

4453. „ = R. cuspidatus, *Thunb.*, ♂.

4455. Table Mt., = Thamnochortus umbellatus, *Kunth*, var. distachya.

4456 ♂, 4457 ♀. Table Mt., = Elegia juncea, *Linn.*

4458 ♀, 4459 ♂. Muisenberg, = Willdenovia striata, *Thunb.*, ♀.

4460, 4461, 4462. Mont. Diabol., = Restio tetragonus, *Thunb.*

4463, 4464. Mont. Diabol., = R. triticeus, *Rottb.*

4465. Muisenberg, = Hypodiscus Willdenovia, *Mast.*, ♂.

4467. Cape Flats, = Willdenovia striata, *Thunb.*, monstros.

4468. „ = Dovea mucronata, *Mast.*, ♀.

4469. „ = Restio multiflorus, *Sprengel.*

4640. In Mont Tab., = Elegia acuminata, *Mast.*
4722. In Mont Diab., = Thamnochortus fruticosus, *Berg.*, ♀.
4730. Table Mt., = Restio compressus, *Rottb.*
4732. Cape Town, = R. quinquefarius, *Nees.*
4758. In Mont Diab., = Thamnochortus dichotomus, *R. Br.*, ♀.
4760. Restio quinquefarius.

SPECIERUM A CL. REHMANN COLLATARUM RELATIO.

623. = Restio compressus, *Rottb.*
627. =R. bifidus, *Thunb.*
631, 632, 635. Ad Montem Tabular.,= Elegia deusta, *Kunth.*
922 et 930. In Mont. Diabol., = Restio filiformis, *Poiret.*
924. pro parte, = Elegia parviflora, *Kunth.*
925, 926. = Restio cuspidatus, *Thunb.*
929. = R. triticeus, *Rottb.*
1184. = Hypodiscus albo-aristatus.
1454. = Restio triticeus, *Rottb.*
1712. = R. multiflorus, *Sprengel.*
1802............ R. Eleocharis.
1805, 1806, 1807. Cape Flats, = Elegia parviflora, *Kunth.*
1808. = Restio bifurcus, *Nees.*
1810........... = Elegia deusta, ♂ ?
2555. In mont. prope Worcester, = Hypodiscus albo-aristatus, *Mast.*
2556. In mont. prope Worcester, = Willdenovia striata, *Thunb.*
2562. „ „ „ = Restio intermedius, *Kunth.*
2564. „ „ „ = Elegia glauca, *Mast.*
2565. „ „ „ = E. parviflora, *Kunth.*
2567. „ „ „ = Restio curviramis, *Kunth.*
2568. „ „ „ = Elegia verticillaris, *Kunth.*
2572. „ „ „ = Restio Gaudichaudianus, *Kunth.*
2674. In mont. prope Worcester, = Cannamois scirpoides, *Mast.*

STUDIES IN VEGETABLE BIOLOGY.—I. Observations on the Continuity of Protoplasm. By SPENCER LE M. MOORE, F.L.S.

[Read 2nd April, 1885.]

(PLATES XIX.-XXI.)

CONTINUITY of protoplasm, other than through the sieves of sieve-tubes, was first announced in Phanerogamia by Dr. Tangl *, in his well-known study of the endosperm of *Strychnos Nux-vomica* and certain palms. It is not my intention to quote the bibliography of a subject which has so fascinatingly influenced authors that a large number of memoirs have already been published upon it; it will suffice here to refer to Messrs. Schaarschmidt's † and Gardiner's ‡ recent papers, wherein ample bibliographical details will be found.

It will be remembered that Tangl discovered the thick unpitted walls of the large cells forming the main mass of the endosperm of *Strychnos Nux-vomica* to be penetrated by threads of protoplasm, which join similar threads running through contiguous cell-walls, whereby the protoplasm of each cell is placed in communication with that of its neighbours. This structure is not to be seen in sections treated with water, a medium which causes strong swelling of the walls, accompanied by their striation, and the differentiation of the layers of thickening into an outer and an inner zone. After the action of dilute alcohol upon dry sections, or, better, of iodine in slightly diluted alcohol, or in potassium iodide, with or without subsequent treatment with chloriodide of zinc, the groups of connecting threads are easily to be seen with moderate powers, the outer threads of each group bowed, the middle ones straight, somewhat after the fashion of the strings of a mandolin. A bird's-eye view of the wall shows that it is uniformly perforated by crowds of small round openings. Minute examination led Tangl to conclude that these openings are entirely occupied by protoplasm, whose inability to take up colouring-matter shows that it is referable to the limiting layer (Hautschicht), a structure well developed in these cells. The walls of the epidermis and immediately underlying thin-walled tissue are not penetrated by threads*, which are also absent from the proximal wall of the layer bounding the chamber in which the embryo lies; except for this they may be traced with ease throughout the endosperm.

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* Pringsheim's Jahrb. f. Wiss. Bot., Band 12 (1879).

† 'Nature,' 1885, Jan. 29th.

‡ 'Nature,' 1885, Feb. 26th.

Had Tangl worked with the seeds of *Strychnos Ignatia* he would have found the examination of the threads a much easier task; to see them it is sufficient to place sections of the hard dark endosperm in water—a cell from the central mass of the endosperm so treated is shown at figure 1. The area of thickening is much swollen, and in the case represented shows a couple of strongly marked striæ close to each other and to the primary wall, but this is by no means the only method of striation; sometimes the outer half only of the swollen area† is marked with a number of fine, closely-placed lines, or it may be uniformly so marked throughout. The lumen of the cell is polyhedral in outline, with convex sides and acute angles, the latter usually pointing towards the corners of the cell; its granular protoplasm contains oily globules. The threads can easily be seen with a ¼-inch objective, but higher powers are necessary for their satisfactory examination, which shows them to be, except for their larger size, similar to the threads of *S. Nux-vomica*; there is the same grouping, the same outward bulging of the flank-threads, the same inequality in calibre, and the same continuity through the primary wall with the threads of neighbouring cells.

Many of the threads of cells treated with water alone appear to stop short at the primary wall, but if sections be placed for a few minutes in a solution of iodine in alcohol, to which is added a small quantity of water, the nature of the intercellular communication is brought more clearly into view (fig. 2). The primary wall can now be distinguished only as a fine bright line traversed by the stained threads, the course of many of which, not being in the same plane as that of the section, appears to be interrupted; the protoplasm within the angular lumina is more deeply stained than that of the threads; it is invested by the more lightly stained limiting layer (represented by the dark outline of the cell-contents shown in figs. 4 & 17). Great difference exists in the calibre of the threads: exceedingly thin at times, they are occasionally so wide in parts as almost to suggest the idea of rifts in the wall, but in this event it is seldom that the rift-like appearance extends very far along the thread. A modification of this rifting here and there occurs in the form of nodular swellings fairly evenly distributed down a thread, or confined to some part of its course (fig. 3). A bird's-eye view of the wall (fig. 5) shows the rounded openings of the thread-embracing canals; they are larger than those of *S. Nux-vomica*, as will immediately be seen on reference to Tangl's figure*.

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* In ordinary circumstances, for in sections placed for twenty-four hours in chloriodide of zinc continuity can be traced right up to the epidermis.

† By "swollen area" I do not mean the primary wall, which itself swells up somewhat in water. *Cf.* figs. 1 & 2.

As already mentioned Tangl finds the threads of *S. Nux-vomica* to consist only of the limiting layer of the protoplasm; this conclusion he founds upon their reaction to colouring media—solutions of carmine in ammonia and in alcohol—neither of which is capable of staining either the limiting layer or the threads. Mr. Gardiner† was, I believe, the first to show that the threads can be made to exhibit the ordinary dye-reactions of protoplasm; the best medium for this purpose he found to be a dye which he calls picric Hoffman's blue‡. In his just-quoted memoir Gardiner enters elaborately into the nature of aniline blues under the impression that Hoffman's is the only, or at all events the best, dye for this purpose; his care is, however, quite needless, for I have succeeded in staining the threads of *S. Ignatia* in the ordinary way, first placing sections in picric acid, washing and then leaving them in Judson's Oxford-blue for a few minutes, and mounting in water or in strong or dilute glycerine. Excellent results have also been obtained with a dye prepared by Gardiner's method, substituting Sands' for Hoffman's blue. Gardiner's experiments tended to show that the threads do not consist of the limiting layer of protoplasm alone, even if that structure enters at all into their composition, Tangl's failure to dye them having apparently been caused by the very faint stain imparted to minute pieces of protoplasm by carmine. For permanent preparation the best mounting medium is water or calcium chloride; glycerine either pure or dilute soon causes some slight change in the wall, whereby the threads become invisible;

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* *L. c.* tab. v. fig. 12.

† Phil. Trans. vol. 174 (1884).

‡ To 100 cub. centim. of strong alcohol is added the same bulk of distilled water; the solution is then saturated with picric acid, and Hoffman's blue added to it until it has assumed a dark blue-green colour; it is then filtered.

this is especially the case with sections which have lain before staining in chloriodide of zinc.

Section of the endosperm in a plane parallel to the axis of growth shows that it is composed of an epidermal layer greatly thickened upon its outer side, beneath which lie several rows of small cells with but slightly thickened walls. These walls react with water very much as do the primary walls of the deeper-lying large thickened cells, that is to say they swell up, but not nearly to the same extent. With a low power (fig. 6) it is not possible to see the primary wall of these cells, but it can be made out with more or less ease right up to the epidermis with a $\frac{1}{8}$-in. objective. These small cells are followed by layers of cells intermediate in size between them and the underlying large cells. In sections which have lain for twenty-four hours in chloriodide of zinc, well-stained threads piercing the walls can be traced as far as the epidermis (fig. 7); the protoplasm is therefore continuous throughout the endosperm.

In his memoir in the 'Philosophical Transactions,' Gardiner contents himself with noticing the fact of continuity in the endosperm of *S. Ignatia* without entering into any details. His failure to observe the interesting differences between this species and *S. Nux-vomica* was probably due to the use of chloride of zinc alone, an excellent reagent for tissues which do not swell up in it to any great extent, but much inferior to solution of iodine in alcohol in the case under notice. To this author belongs the credit of first discovering an instance in which continuity through the walls of endosperm-cells can be seen without special reagents (*Bentinckia Conda-panna*) *. Here, however, comparatively high powers are required, and as the walls are said to show merely an "appearance of striation," it is clear that the fact cannot be verified with the ease that it admits of when *S. Ignatia* is examined †.

Tangl ‡ expressly says that the endosperm-cells of *S. potatorum* do not show continuity. The chief difference between these cells and those of *S. Nux-vomica* is that their lumen is not round, but produced towards one or more of the faces of the primary wall, often to such an extent as to touch the latter. Professor Strasburger* doubts the accuracy of Tangl's statement; he believes that communication is maintained by groups of threads running through the wall from pit to pit, but he is not quite satisfied about the point; and Gardiner leaves matters in the same state. The seeds sent me from Kew were, I suspect, from the same sample as those which Gardiner† examined; they were so old and dry as to afford little chance of satisfactory examination; however I have sometimes seen the method of continuity shown at fig. 8, and occasionally caught sight of fine threads running concentric with and occupying the interval between the two intramural threads there figured. The only doubt which I have with regard to this species is whether the cell-walls themselves be not penetrated by threads. Treated with water both primary wall and secondary layers swell up greatly, the former especially at the angles, the latter to differentiate into an inner many-striated zone, and an outer one marked by a great number of minute dots; the striation of the inner zone is continued alongside the canals where they are present (fig. 9). If a section is placed in a drop of solution of iodine in alcohol upon a slide for a minute or two, and a cover-slip being put on, is then carefully irrigated with water, in some part of the section the dots just referred to may appear in the form of interrupted lines which seem to radiate on all sides, from the lumen to the circumference of the cell. Whether, however, these be cords of intercellular communication or small rifts occurring only in old seeds, or, as they sometimes seem to be concentrically disposed, merely interrupted striæ of the layers of thickening, I am quite unable to decide.

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* Phil. Trans. memoir.

† For this reason, and because of the low powers sufficient for the demonstration, the use of *S. Ignatia* seeds is strongly to be recommended for class purposes.

‡ *L. c.*

The cells of the horny endosperm of *S. spinosa* swell up so much in water that the lumen is frequently all but obliterated; the layers of thickening differentiate in water into two sharply-defined zones, a narrow inner strongly, and a wider outer faintly, striated one. Through the walls of cells treated with iodine in alcohol and partially swollen up in water continuity can be made out if care and patience be brought to the examination; it is, however, a matter of difficulty to see the threads, the remarkable striation of the wall greatly impeding the view of them (fig. 10).

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* 'Ueber den Bau und das Wachsthum der Zellhaute.'

† Phil. Trans. memoir.

The chloriodide of zinc method is quite inapplicable to this case, from the violent swellings which that reagent causes; for the same reason it is impossible to stain the threads with aniline dyes. The subepidermal cell-layers have thicker walls than have the other species of the genus. As is the case with *S. Ignatia*, so here prolonged use of chloriodide of zinc serves to demonstrate continuity up to the epidermis.

Mr. Gardiner* has discovered continuity in the endosperm of a large number of seeds referable to many of the natural orders; but with the exception of *Tamus* and *Dioscorea*, which have unpitted endosperm, communication is established through the wall at the bottom of pits. The endosperm of at least two species of *Diospyros* (*embryopteris* and *melanoxylon*) greatly resembles that of *Strychnos Nux-vomica*; dry sections near the surface show a number of round lumina lying apparently in a homogeneous matrix; but if sections be cut in planes near and parallel to either of the three planes mutually at right angles which roughly divide the seed of *D. embryopteris* into symmetrical halves, the cells composing the core of the endosperm will be seen to be greatly elongated. Placed in water the contour of the cells becomes more or less evident, but the walls swell up only to a slight extent, and that slowly. In this case the method of demonstration invented by Gardiner, with the slight modification already mentioned (p. 597), was resorted to—indeed, it is the only one which will satisfactorily bring the threads into view. Sections were placed in chloriodide of zinc for several hours (usually about a day); they were then removed and examined in this condition, or washed until disappearance of the brown stain, and dyed with picric blue. Figure 11 shows one of the cells with round lumen and its connections with its neighbours as seen before, and fig. 12 another as seen after, the action of the dye. One remarkable point about this is the difference in the number of the connecting threads; close to such a state of things as is drawn at fig. 12 one may find cells intercommunicating by means of a much larger number of threads. As this cannot be due to incomplete staining, since precautions were taken to ensure saturation with the dye, one cannot but conclude that the threads are apt to become obliterated. The protoplasm of the long cells is also connected with that of the neighbouring cells on all sides (fig. 13). Continuous rifts in the wall may sometimes be observed in thin sections—one of these is shown at fig. 14; whether such result from splitting of the tissue during section or are congenital or consequent on absorption I do not know. Figure 15 shows a small portion of the wall penetrated by holes of varying calibre. Investing the seed are several layers of thin-walled cells forming a somewhat spongy testa, immediately beneath which the outermost endosperm-cells are smaller and thinner than the underlying ones; nevertheless continuity can be traced across their walls. In all essentials *D. melanoxylon* resembles the species just described.

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* Phil. Trans. memoir.

One point of great interest remains. Hitherto, as far as I am aware, no one has succeeded in tracing the connection between the intramural threads and the cell-protoplasm. Tangl* says that employment of ordinary reagents causes total plasmolysis, and subsequent authors seem, by their silence, to acquiesce in the truth of the statement. So much attention has recently been directed to this matter † that I have made a special study of the plasmolysis of the cells of *Strychnos*, and find that Tangl is incorrect. It is true that in the case of many cells the exhibition of strong reagents is followed by a plasmolysis which is total, but this is by no means always the case. The best way of observing plasmolytic threads is to place sections in a drop of solution of iodine in alcohol on a slide, a minute or so afterwards placing a cover-slip upon them and examining either in this state, or after addition of a small quantity of water. Figures 16, 17, and 18 were drawn from sections treated in the latter way, the first of them from *S. Nux-vomica*, the second from *S. Ignatia*, the last from *S. potatorum*. Although easily overlooked, the threads can readily be made out with care; in many instances they may be seen to run into the intramural threads. Figure 18 represents an unusual condition; although plasmolysis has been violent, yet some of the threads extend unbroken across nearly half of the cell's lumen. It will be observed that in the cases of partial plasmolysis here figured the protoplasm remains for a part of its course in close apposition to the wall of the cell, and it would seem at least possible that the persistence of the threads is due to this fact, the close relation between wall and plasma acting as a steadying force whereby the shock of plasmolysis is lessened, especially at the opposite side of the wall, which is usually where the threads occur. The demonstration of the threads is a matter of cautious treatment with water, for, if the iodine tincture be made too dilute, the cell-wall swells up violently, and the threads are broken; however, it often happens that they can still be distinguished in the form of frays upon the edge of the contracted pellet of protoplasm (fig. 4). *S. potatorum* differs from its congeners in the minute pitting of the cell-wall: the pits in ordinary section are seen to be very narrow slits; in oblique section they present a pectinate appearance upon the wall (figs. 18 & 19).

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* *L. c.*

† H. de Vries, "Untersuch. üb. d. mechanisch. Ursachen d. Zellstreckung;" Gardiner, Phil. Trans. memoir, and Proc. Roy. Soc. 1882; Bower, Quart. Journ. Micr. Sc. 1883.

I have also, on very rare occasions, seen plasmolytic threads in sections of the endosperm of *Diospyros embryopteris* treated for several hours with chloriodide of zinc, and stained with picric blue. Years ago Pringsheim * showed that such threads could be seen in cells of fern-prothallia, *Riccia*, &c. acted upon by weak chloriodide of zinc, but I was unprepared to find them after prolonged action of the strong reagent. Figure 13 represents the best example obtained; two only of the threads could be traced with distinctness into intramural threads, the connection of the rest not being patent. The threads, whether of *Strychnos* or of *Disopyros*, stained well, those of the former with iodine, those of the latter with picric blue.

Continuity in the Florideæ.

It has long been known that the cells of certain Florideæ are placed in communication with each other by means of plasma-containing apertures in their walls. A cursory examination of Nägeli's works † is sufficient to show that he had very clear conceptions upon the subject. In the case of several genera (e. g. *Callithamnion*, *Laurencia*, *Peyssonellia*) he figures pores which he describes as having each a small elliptical opening in the centre; and it is plain from the context that he understood them to function as organs of intercellular communication. Kützing ‡, too, occasionally figures continuity; and Zanardini §, in the text accompanying two of his figures, speaks of cells "anastomosing" and "uniting to form a network." At the same time it must be remembered that continuity is only casually figured in the great illustrated works on Phycology, and has often been overlooked even by observers of the first order*. Indeed, it is not until we come down to recent times that we find the subject to have been specially attended to.

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* 'Bau und Bildung der Pflanzenzelle.'

† 'Die neuern Algensysteme;' On the Nuclei, Formation and Growth of Vegetable Cells, Ray Society's volume for 1845; Sitzb. d. Königl. Bayer. Acad. 1861.

‡ 'Phycologia Generalis.' See tabb. 63, 65, 79, and others.

§ 'Iconographia Phycologica Adriatica,' *Chondrus? adriaticus* (tab. 38), and *Schizymenia minor* (tab. 62).

Mr. Archer† seems to have broken the first ground by his study of *Ballia callitricha* and allied species, the young cells of which he concluded to be in open communication by means of a pore, which is immediately sealed up by the development, at both its ends, of a plug or "stopper" formed of a substance giving none of the reactions of starch or cellulose. Professor Wright‡, of Dublin, observed similar phenomena in *Polysiphonia* and *Griffithsia setacea*. *A propos* of the growth of *Polysiphonia*, he says (p. 516):—"In its early condition the tips of the rays and of the two ends are quite distinctly open, and the protoplasmic contents freely communicate with the tube-like cells above and below and the siphon-cells around it; but as it becomes mature, and as a cell-wall is definitely formed around it, these pore-openings are closed up, and these plugs will prevent sometimes even the 'stopper'-like form described by Archer; so that here, as in *Griffithsia*, it seems to me that these plugs or stoppers are, as it were, only the result of the cell finally closing itself up." Merely mentioning that Agardh § figures some cases of undoubted continuity, we come to the poorly illustrated memoir of Schmitz ‖, whose views are quite different from those of his predecessors. He holds that, with the exception of the Corallines, whose cells intercommunicate by wide open pits, the pits are closed by means of an exceedingly thin membrane, on each side of which lies a plate of very thick substance, dyed intensely with hæmatoxylin &c. These plates, he says, are connected together by means of numerous strands of protoplasm, which penetrate the closing membrane chiefly or exclusively at its circumference, and unite laterally to form a hollow cylindrical band of intercellular communication. He notes that the substance of the closing membrane greatly resembles the slime of sieve-tubes, and thinks that the plates may perhaps result from local differentiation of the parietal protoplasm. Soon after the appearance of Schmitz's paper we find Mr. Hick* returning to the old view of Nägeli, but observing that in some cases a "diaphragm," traversed by a strand of protoplasm, is developed within the "collar" through which the connecting-thread passes. Mr. Massee† has recently studied the development of *Polysiphonia urceolata* and *fastigiata*. He figures the cells as, at an early stage of their history, opening into one another by wide canals, unprovided with ring, plate, or membrane, but as afterwards shut off by the formation of plates of cellulose perforated for the passage of threads of protoplasm. Lastly, the subject has been studied by Mr. Gardiner, whose preliminary notice‡ I have failed in obtaining a sight of, after many endeavours. However, from a short paper in 'Nature' (Feb. 26th, 1885), it appears that Gardiner's results are, at least in the main, confirmatory of Schmitz's, as he says that, by the aid of chloriodide of zinc, he has been enabled to make out the existence of a pit-closing membrane in every case examined.

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* For example, Pringsheim, in his "Beitr. z. Morph. d. Meeres Algen," Abhandl. d. Königl. Acad. d. Wissensch. z. Berlin, 1862.

† Trans. Linn. Soc., new series, Botany, vol. i.

‡ Trans. Roy. Irish Acad. vol. xxvi. 1879.

§ 'Florideernes Morphologi.'

‖ Sitzb. d. Königl. Acad. d. Wissensch. z. Berlin, 1883.

It may then be said that four views of protoplasmic continuity in the Florideæ have been enunciated:—

I. Continuity is direct, by means of a pore functioning as a simple canal of communication.—Nägeli (and also Kützing, Zanardini, &c.).

II. Continuity is direct, by means of a wide or narrow strand of protoplasm passing through a ring of harder protoplasmic substance, within the circumference of which a closing membrane may be formed.—Hick.

III. Continuity direct, but soon interrupted by the formation of "stoppers" over the mouths of the pore.—Archer, Wright.

IV. Except in the Corallines, continuity is indirect always, the connecting-threads passing through a pit-closing membrane.—Schmitz, Gardiner.

CHONDRUS MAMILLOSUS.—The common species of this genus (*C. crispus*) was very faithfully figured by Kützing §, the figure being by no means improved upon by Hick *. Its rarer congener, *C. mamillosus*, shows continuity in a still more striking form. The thallus of both may be said to be formed of two orders of cell—outer small elliptical ones placed in longitudinal rows perpendicular to the surface, and inner larger ones provided with radiating arms, aptly compared by Mr. Hick with multipolar nerve-cells. Both authors figúre continuity throughout the thallus, in the outer cells by means of fine threads, on which the rows appear like strung beads, in the inner ones by the coalescence of their arms, "uniting to form a network," as Zanardini says of his *C.? adriaticus*. The arms of the inner cells of *C. mamillosus* are much longer than those of *C. crispus*, and the lumen is sometimes reduced to a mere junction-point of the arms (fig. 20). In many cases the arms of neighbouring cells are not continuous, and the cells are placed in communication by means of a single fine thread of protoplasm, at or near the centre of which is placed a shining bead-like nodule, through which the thread passes without undergoing division. In other cases a nodule is not seen, and the arms of neighbour cells appear to simply coalesce. The small outer cells are more numerous than is the case with *C. crispus*; they unite with their under- and overlying as also with their lateral fellows by single fine filaments, which may or may not be provided with a nodule. In no instance was it found possible, with sections well stained with Judson's Oxford blue, to resolve the connecting filament into two or more, nor was any evidence obtained of its division in passing the nodule.

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* 'Journal of Botany,' Feb. and March 1884.

† Journ. of Roy. Microsc. Soc. 1884.

‡ Proc. Camb. Phil. Soc. Feb. 11th, 1884.

§ *L. c.* tab. 73.

POLYIDES ROTUNDATUS.—A section of the thallus in a plane at right angles to the axis of growth shows that it may roughly be said to consist of three tissue-areas:—1st, the epi- and hypodermis, composed of small cells more or less elongated perpendicularly to the surface; 2nd, a middle zone of larger cells filled with starch-granules; 3rd, fibre-like cells forming the central mass. A view of this is given at fig. 22. Continuity seems to hold throughout the thallus of this type, although it is impossible to see the connections of all the cells in any one section. Also, the continuity is direct, by means of a slender thread upon which a small nodule staining well may frequently be seen. By means of these threads the epidermal cells unite, either singly or in pairs, with a cell of the subjacent layer, which itself communicates, alone or with its lateral fellow, with the longer cell immediately beneath it; and the same relation holds with the two succeeding layers, and with the outermost layer of granular cells, but deeper down I have failed to trace any dual connection. The cells of the middle zone are more or less ovoid in outline, with the exception of the innermost ones, which are lengthened out more or less perpendicularly to the surface, and often correspondingly narrowed. From the extremity of each of these latter cells a filament of protoplasm runs into one of the cells of the central zone, union occurring, in all observed cases, near an end of this cell (fig. 23). The central-zone cells course irregularly, but with a general up-and-down direction, through the frond, accompanied by rows of smaller cells with granular contents; they are greatly elongated and somewhat clavate at the ends, and united each by a slender thread of protoplasm to its supra- and subjacent fellow, but never with their circumjacent neighbours. Examination with high powers failed to resolve the threads, nor could their division in the neighbourhood of the nodule be ascertained (fig. 24). Similar structure is possessed by *Furcellaria*, from which *Polyides* differs so slightly as scarcely to be distinguishable, except when fruiting.

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* *L. c.* tab. 244. fig. 12.

CERAMIUM RUBRUM *.—The branches of this type are composed of an axial range of large round cells, covered over with much smaller ones, and with others intermediate in size packed in the intervals left between the central cells. Fig. 25 *a* shows two of the large cells, and the way in which they run towards each other by means of wide pits. The cells have, as is usual in the Florideæ, a dense layer of protoplasm investing the more fluid contents, which are granular and contain crystalloids. The protoplasm of the pits is either apparently homogeneous or distinctly granular; over it can usually be traced a delicate limiting layer. The pits do not meet, owing to the interposition of a plate of membrane riddled with fine pores, through each of which passes a fine strand of protoplasm into the pit of the adjoining cell (figs. 26, *a* & *b*, 25 *b*). The membrane is circumscribed by two annular pieces of highly refractive substance, and presenting, as it itself does, all the reactions of protoplasm, one belonging to and surrounding the distal end of each pit, but so closely placed are they as to be easily mistaken for a single piece. These pieces, together with the membrane, will be spoken of as forming a "ring." In longitudinal section the central cells appear as so many large beads threaded upon a string made up of conjoined canals and rings. Similar but smaller rings are interposed between the central and intermediate cells. The protoplasm of the pit comes flush up with the contour of the ring, and remains in close connection with it, and this makes discovery of the membrane-piercing threads difficult.

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* I suspect that this may be referable to some other species; for the axial cells of other specimens (typical and varietal) of *C. rubrum* which I have had the opportunity of examining all have much shallower pits.

The small outer cells present a type of continuity already dwelt upon. Each cell, polyhedral in outline, and with a dense layer of protoplasm placed, with but a few small intervals, against the whole wall, is connected with its circumjacent fellows by a single fine filament, at or near the centre of which is placed a bright bead-like particle, similar to those on the connecting-threads of *Chondrus* and *Polyides* (fig. 27). Examination with a high power (900 diameters) failed to indicate any division of the thread in passing the bead. By studying the development of the beads it is shown that they are of the same nature as the rings, but they differ from them in not being provided with a membrane.

CERAMIUM RUBRUM, var.—In longitudinal section are seen a central row of long, nearly rectangular, surrounded by a number of small cortical, cells; others, intermediate in size, occupying the interval between the pairs of large cells, as well as forming a continuous layer immediately investing them. In the floor of the central cells is a small ring, the membrane of which is perforated at several points of its circumference, and occasionally elsewhere. Threads of protoplasm pass through the perforations, and connect the protoplasts. The cortical cells resemble those of the form last mentioned.

The thallus of LAURENCIA HYBRIDA is made up of external, nearly isodiametral, and a central core of cells lengthened in the direction of the axis of growth. The walls of either type are greatly thickened. The protoplasts are connected with their neighbours by strands which run up the pits, each to a single ring, undivided through the centre of the membrane of which, or, as is usually the case, divided at its circumference or whole face, it passes into the contiguous pit.

CHYLOCLADIA ARTICULATA.—The branches, resembling those of an *Opuntia* in miniature, consist, in fully grown parts, of a series of chambers, of which the roof and floor, situated at the narrowed portions, are made up of several layers of short cells. Cells many times longer than broad occupy the centre of a young chamber, but by its expansion during growth gaps occur between them. Fig. 28 shows the method of connection between the short and long cells, and between those of either kind and their fellows. The long cells are frequently clavate, and the ends are joined to their supra- and subjacent fellows by saddle-shaped surfaces. Their protoplasm is continuous through circumferential or scattered pores in the closing membrane of often broadly contoured rings (fig. 29 *a*, *b*, *c*). Similar rings serve as media of communication between the sides of contiguous long cells. The walls of the chambers are built up of small cells, externally underlain by several layers of larger ones resembling those of their roof and floor. These latter cells communicate by means of rings, through whose membrane a single or several strands may pass (fig. 30 *a*, *b*). The connection between the external cells is by means of fine nodule-bearing filaments, of whose division in passing the nodule proof was not obtained.

Of the genus CALLITHAMNION, a small fragment only, belonging to an undetermined species, has come under observation. In one case the achromatin fibres and commencing formation of a cell-plate were well seen (fig. 31 *a*). At the next stage examined (fig. 31 *b*) the cell-wall has closed up except where it yields passage to a fine thread, at either end of which is a gleaming particle recognizable from the ordinary protoplasm with which the young cells are gorged. Fig. 32 *a* shows the ring definitely formed; and 32 *b* division of its intercellular protoplasm in passing through the membrane: in this case the ring has been ruptured; otherwise demonstration of division at this stage is very unsatisfactory.

GRIFFITHSIA SETACEA.—The branches are composed of a single range of cells with broad ends, between which, at the blind end of somewhat wide pits often filled with granular protoplasm, is a small thin ring provided with a membrane pierced with holes over all its surface.

PTILOTA SERICEA.—A figure showing continuity at and near the growing-points is given by Hick*. The frond consists of an indefinite main axis bearing a number of opposite secondary axes, themselves bearing axes of the third degree, and so on. The axis of a branch is formed of scutcheon-shaped cells, each of which gives origin on each side to a cell which is the basal cell of a branchlet, and with which, as with its preceding and succeeding axial cell, communication is ensured by the agency of a filament, slender at first, but rapidly increasing in calibre. In the earliest condition observed by me a bright point of plasma has made its appearance at the top of the protoplasm upon the contiguous faces of the ultimate and penultimate cell; these points rapidly grow, and soon form a small ring through which the connecting filament passes. After the formation of several axial cells the branch becomes corticated: the first step in this is the shutting-off, except for a fine filament, of a small cell from both the upper and under face of the axial cell at its distal end. A couple of small wing-like cells then make their appearance, one on each side of the proximal wall of the new cell, with which latter they remain in filamentary connection. Meanwhile the basal cell of the branchlet on each side has lengthened downwards, and, dividing transversely, it occludes from the external world the side of the axial cell. At the proximal end of the latter small cells are now budded off, the whole of the cells thus formed repeatedly dividing and growing into a firm cortex round the axial cell. Since every cell remains in permanent filamentary connection with its parent, it follows that there is continuity in one way or another throughout the thallus.

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* *L. c.* tab. 244, fig. 9.

Before cortication has advanced to such a stage as to shut out the axial cell from sight, the continuity of the axial cells has plainly become indirect. Fig. 33 shows a surface view of a ring in this condition, its membrane having a couple of pores. Further down the evidence of indirectness is much clearer. Fig. 34 *a* is a view in longitudinal, and fig. 34 *b* one in transverse section, of a well-grown axial cell. In consequence of the tenacity of the protoplasm (a fact of such constant occurrence in the Florideæ) demonstration of continuity is very difficult. The longitudinal section shows a broad ring, from either side of whose circumference stretch threads and films of protoplasm to join the protoplasm of the cell. In the transverse section a number of threads are seen passing into fine pores upon the circumference and just within the contour of the ring. The ring is stopped with membrane upon which filmy cell-protoplasm can in some parts be seen; it is probably this which prevents a sight of the pores all round the ring, for the pores can be traced with tolerable ease where there is no overlying protoplasm. Near the centre is a bright point which may also mark the position of a pore. The axial cells communicate with their daughter cortical cells by means of rings similar to, but smaller than, those between the axial cells themselves.

Delesseria alata.—The midrib of the frond is composed of several series of long wide cells with broad ends arranged in longitudinal rows separated by smaller cells, of which some have a wide, others a narrow lumen (fig. 35). Examination of the larger cells by means of longitudinal and transverse sections of the midrib of old parts of the frond, reveals a method of continuity different from anything hitherto remarked upon. Reference to figs. 35 and 36 will show that a large part of the floor and roof of neighbour cells is closed up by membrane, round which at certain points are placed small rings, to each of which runs a stout cord of protoplasm. The rings are themselves covered in with membrane similar to that which isolates the cells; this membrane is pierced either by several holes, in which case the strand of protoplasm is divided in passing it, or in some cases where the ring is small, there is a single hole at the centre of the membrane (figs. 37 and 38). All round the large membrane can usually be traced with more or less ease a slender ring of highly refractive substance, similar to that of which we have seen the contour of the rings to be composed. Fig. 35 shows these matters in transverse section; in this case there are four small rings visible, and apparently a fifth veiled behind a cloud of protoplasm; their number, however, varies between three and five.

The only interpretation that can be put upon these facts is that the large membrane surrounded by its fine ring of gleaming protoplasm is homologous with the ring of *Ptilota* or *Ceramium*; and that the small rings are accessory structures. It is therefore proposed to call the former the "primary" ring, and the small rings "secondary" ones. The rings will be spoken of as "compound" or "simple," according as they have or have not secondary rings.

In some cases it would perhaps seem that a simple ring is interposed between two of the large cells. I am inclined to think that fig. 40 represents such a ring, although it was not possible to make out satisfactorily that there were not small secondary rings at the circumference of the larger one.

The primary ring is closely attached to the inner boundary of the incomplete roof-and-floor wall of the cells, which is frequently wavy in outline. Even when best developed, it is very slender; in profile view it can be easily recognized as a continuation of the secondary rings (fig. 37, *a*). The secondary rings, although usually circumferential in position, are not always so. Fig. 41 shows a small membrane, near the centre of which are placed what appear to be small secondary rings; a string of protoplasm is attached to one of them.

The larger of the cells surrounding the rows of wide ones communicate with the latter, and with their fellows, by means of rings which in some cases at least are compound (fig. 41). The rings between the cells with narrow lumen are small and simple. The small epidermal and immediately underlying cells are connected by fine nodule-bearing threads similarly to those of *Ceramium rubrum* (fig. 27).

Working with dried material, I have laboured under a distinct disadvantage in studying the development of these rings. All that I have learnt about the matter is this:—Below the almost hemispherical apical cell of a growing branch are two demilune cells, one beneath the other. Beneath this is a similar but larger demilune cell which divides into five cells, two on either side of a central scutcheon-shaped one. The outermost cell on each side takes part in the formation of the thin lamina of the frond; the central cells rapidly elongate in the direction of the axis of growth, and after a time a transverse septum divides each of them in turn (fig. 42). Although the cells for some time after their formation are in very close apposition, it is possible, with the aid of chloriodide of zinc and by careful focusing, to see numerous small dots of protoplasm between the newly formed cells. These ultimately disappear with the exception of a single fine thread, at the centre of which is swung a small bright nodule of protoplasm (fig. 42). The intercellular threads appear to persist until division of the cells is definitely completed, whereupon, except for the one thread, they rapidly vanish; by this means continuity is maintained throughout the whole thallus. Until now cell-division has been at right angles to the plane of the thallus; but by a series of divisions parallel to that plane the formation of a midrib is announced. In the earliest condition of distinct continuity between the largest as also between the other cells, I have never seen more than one strand of protoplasm. Some little way below the growing-point the connection between contiguous large cells is as shown at fig. 43, where at least three fine strands of protoplasm pass each of them through a small nodule apparently without undergoing division. At this stage the ring is still in the simple condition; a view from above of the cell-closing membrane with three nodules in the stage represented at fig. 43 will be found at fig. 44.

POLYSIPHONIA NIGRESCENS*.—Each branch of the frond has a single longitudinal series of large axial cells, every one of which is surrounded by a number of smaller siphon-cells equal in length to it. The axial cell communicates with every siphon-cell by means of a well-defined ring, the membrane of which is everywhere pierced with holes (figs. 45 and 46). The rings are usually placed halfway up the axial cell; but it often happens that they are not all upon the same level. The upper and under surfaces of the latter cell are largely composed of membrane resembling in this respect the large cells of *Delesseria alata*. In fig. 47 an endeavour has been made to represent this, as seen in a longitudinal section through the roof and floor of two axial cells. Upon the right a small portion of the very slender primary ring is visible, and several secondary rings also appear in it; although these rings are small, the protoplasm distributed to them is divided in passing them (as is shown, but not satisfactorily, by the ring near the median line of the section). Fig. 48 represents a bird's-eye view of a membrane; several small secondary rings can be distinguished at its circumference; while upon a large part of it lies a quantity of tenacious protoplasm.

The siphon-cells are connected with their neighbours by small rings with perforated membranes (fig. 50). Upon the circumference of the axial cells at the nodes, and alternating in position with the rings connecting an axial cell and its siphon-cell, are placed a number of small rings; from each of these a delicate strand of protoplasm, sometimes here and there thickened, emerges to pass into the small ring of a cell much less in size than the siphon-cells between and beyond the outer portion of which it is situated (fig. 49). Similar cells intercommunicating by small rings are situated in the neighbourhood of the cell just mentioned.

POLYSIPHONIA FASTIGIATA differs greatly from the foregoing. In the oldest condition in which I have seen it, the axial cells communicate with each other by means of a small ring with perforated membrane. The protoplasts—amœboid in appearance from the presence round their equator of a number of stout processes, the agents of axial-siphonal continuity—are very dark in colour, but, when boiled in caustic potash and stained with chlor-iodide of zinc, indirect continuity can be made out without much difficulty (fig. 51).

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* I have not been able to get a sight of Kolderup-Rosenvinge's 'Bidrag til Polysiphonia's Morphologi,' quoted by Schaarschmidt (*l. c.*).

HALURUS EQUISETIFOLIUS.—But if the large cells of *Delesseria alata* and *Polysiphonia nigrescens* are in great measure composed of membrane, the row of larger cells, of which the axes of *Halurus equisetifolius* are made up, show the opposite condition of things. The protoplasm in these cells is placed in continuity by means of a relatively small broadly-contoured ring placed at or near the centre of the wide flat wall of partition (fig. 52). Upon the membrane lies protoplasm in such quantity that the perforations are masked; the semi-profile view of the figure, however, shows that some at least of the threads are circumferential.

Each of the axial cells of a branch bears near its top a whorl of frequently ramifying branches composed of a single row of small cells several times longer than broad. With the basal cell of every branch the axial cell communicates through a small perforated ring; and a similar but smaller ring is placed between every pair of cells of the branch. The origin of these rings seems to be the same as that of those hitherto described; that a membrane is developed in them very early is shown by fig. 53, which represents the membrane between the ultimate and penultimate cell of a branch from a preparation boiled in caustic potash for a minute or two, and then stained with picric blue. From the branchlet's basal cell ultimately descend corticating fibres resembling in structure the branches themselves. The connections between the cells of these are similar to those between the cells of the branch.

BALLIA CALLITRICHA.—If one of the main branches of this species be examined a short way above the point where cortication begins, the junctions of its single series of axial cells will present the appearance shown at fig. 54. It would seem at first sight that, in accordance with Harvey's * description, the upper cell protrudes into the lumen of the lower; but, as Mr. Archer † showed, the reverse is the fact: this can be ascertained without much difficulty by cutting off the branchlets of an uncorticated branch and turning the flattened axis through an arc of 90°. In

* In Hooker's 'Journal of Botany,' 1840.

† Trans. Linn. Soc. 2nd ser. Bot. i. p. 211 *et seq.*

the centre of the upper cell's floor, as also of its underlying neighbour's roof, is a highly refractive knob-like structure fixed to the wall of partition. These knobs are what Archer calls the "stoppers." The curious articulation gives origin to what he terms "bottles." An idea of the method of continuity in this type will be gained from inspection of figs. 55 and 56. Each stopper rests upon a thin bed of membrane similar to the membrane closing the rings of other Florideæ; and the wide intercellular pit is apparently filled with the same substance. The circumference of the stopper's base is continuous with the thin parietal layer of cell-protoplasm, and can frequently be easily distinguished as a dark line from the brighter mass of the stopper: the base itself is filled up with membrane upon which the mark of the pit is very clear (fig. 55). From the circumference of the base of a stopper fine threads run up the pit to be similarly inserted on the contiguous stopper. It will thus be seen that *Ballia* resembles other Florideæ in the method of continuity, its chief points of difference being the extent to which the membrane is developed, and the remarkable form assumed by the highly refractive portions of the ring.

The stoppers are endowed with an extraordinary power of growth. Originally making their appearance, like the halves of an ordinary ring, as two gleaming pieces of protoplasm upon the contiguous faces of just-formed cells, between which a narrow channel of protoplasm extends (fig. 58), they rapidly enlarge and continue to do so, it would seem, almost without limit (fig. 57)*.

The view here adopted is that continuity is always direct in the early history of the cells, and in some cases (*Chondrus*, *Polyides*, *Furcellaria*) persistently so; while in others direct continuity may persist in one part of the thallus, and be supplanted by the indirect form in another (*Ceramium rubrum*, &c.). The young cells are placed in communication by means of a fine filament upon which is in most cases placed a small nodule, just as a bead is strung upon a thread. The ground for this statement is that in surface views of the nodule only a single small central pore can be seen, and that the thread itself, as slender as the single threads piercing the membrane of rings, cannot be seen to undergo division in passing the nodule.

The next fact to notice is the rapid growth of the thread accompanied by concurrent growth of the nodule to form a ring. Meanwhile the protoplasm between the two pieces of highly refractive substance which form the contour of the upper and under faces of the ring has commenced to differentiate a pit-closing membrane, which either occupies the whole of the space bounded by the ring's contour, with the exception of a single narrow canal at or near the centre, through which the connecting thread passes, or partially fills up the space, leaving circumferential or scattered pores. Whether the original connecting filament is always really single from the first is doubtful in such cases as the wide axial cells of *Halurus equisetifolius* and of the main branches of *Ballia callitricha*. A typical ring with upper and under highly refractive contour-lines and perforated membrane being formed and increasing in size concurrently with the growth of the cell, the strands of protoplasm passing through the membrane may themselves become surrounded by a small ring, and growing rapidly in calibre just as did the original filament, like it may themselves be divided in passing this secondary ring by the development of a membrane in the latter. I am not sure whether some of the large simple rings before mentioned do not eventually become compound: in *Ptilota sericea*, for instance, on one occasion a small ring was observed, to which convergence of two strands of protoplasm was plainly made out. This is a matter requiring further elucidation.

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* Several enlarged stoppers are figured by Archer (*l. c.* pl. xxviii.).

It has frequently been the subject of remark that the parietal protoplasm of the floridean cell is of a denser consistence than that which it surrounds. A glance, for instance, through the plates of Thuret's and Bornet's 'Etudes physiologiques' will be sufficient to establish this point. Figs. 25 *a* and 27 of the present memoir may also be quoted in proof of the same. A modification of it consists in the distribution of dense highly refractive protoplasm in the form of a network upon the wall. This reticulation, originally observed, I believe, by Nägeli, seems to be of common occurrence. In most of the types examined by me it is more or less easily to be made out; but the most beautiful example I have seen is in *Polysiphonia nigrescens*, from which a drawing of a portion of a siphon-cell's contents will be found at fig. 59. In another modification the protoplasm is arranged in broad lines down the wall of the cell; good examples of this occur in *Ballia callitricha* and *Halurus equisetifolius*. Now the tenour of my observations—inconclusive, it is true, from the want of living material—is to the effect that in the newly formed cell a ring of dense parietal protoplasm arranges itself round the debouching point of the filament connecting it with its neighbour, just as it would arrange itself anywhere else upon the wall. The pit continuing to deepen, two closely apposed pieces of protoplasm are strung upon the pit-traversing thread. Where the pit does not appreciably deepen (*Ballia callitricha*, *Callithamnion* sp.), the ring has a somewhat different appearance. I cannot therefore acquiesce in Schmitz's statement, that a *plate* of highly refractive substance is placed at either side of the pit-closing membrane, for surface views almost always show the bright contour of a ring; the highly refractive substance upon the membrane sometimes met with (e. g. *Chylocladia articulata*, secondary rings of *Delesseria alata*) is, I venture to think, brought there subsequently to the formation of the ring.

One point worthy of mention *à propos* of the comparison of these cells with sieve-tubes is this:—The cell-protoplasm is frequently found to be densely aggregated on one side or on both sides of a ring. Good examples of one-sided aggregation are found in the long cells from old chambers of *Chylocladia articulata* (fig. 60), of two-sided in *Halurus equisetifolius* (fig. 61): in the latter type cords of protoplasm may frequently be seen passing from a plate-like aggregation at the top of the cell to the more fluid protoplasm lying beneath it.

Running down the cell from stopper to stopper is sometimes found a stout band formed of dense, completely investing more fluid, protoplasm. *Ballia callitricha* shows this better than any other type studied by me (fig. 57): such a band may sometimes traverse the lumen of the axial cells of *Ceramium rubrum*; and as its calibre is equal to that of the pit, the impression is produced of a cord coursing uninterruptedly through several of the cells (fig. 62)*. I would suggest that this may be a means whereby more rapid molecular transference is effected.

With reference to the question whether the substance of which the bright contour of the rings is composed be really protoplasm I would merely remark that there seems no reason why it should not be so regarded. Archer† showed that the stoppers of *Ballia* are soluble in boiling caustic potash; and this is also the case with the contour of ordinary rings; but upon this ground there is as much reason for regarding crystalloids not to be of protoplasmic nature as these ring-contours. It is only in the wide sense which modern research has given to the conception of protoplasm that I wish to be understood when referring the composition of the rings to that substance.

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* A somewhat similar disposition of the protoplasm is figured by Hick (*l. c.* tab. 243, f. 6) in the axial cells of *Ceramium acanthonotum*.

† *L. c.* p. 214.

Postscript.—As tending to confirm the conclusions arrived at from the necessarily incomplete study of development contained in the foregoing pages, it would have been advisable to quote in more detail Mr. Massee's before-mentioned paper on "*Polysiphonia* (*fastigiata* and *urceolata*)" in the 'Journal of the Royal Microscopical Society' for 1884. Massee's method was to remove the wall from cells near the growing-point by soaking for several hours in a solution of nitro-picric acid. By this means it was found that the young protoplasts are connected by fine marginal threads, as well as by a thicker central band of protoplasm, and that, with the exception of an aperture for the passage of the latter, the protoplasts become isolated by the gradual development of a cell-wall between them. The aperture increasing in size with the growth of the cell, is after a time spanned by a sieve-plate, which, as already stated, this author considers to be composed of cellulose.

Reference should also be made to Mr. Hick's recent paper ('Journal of Botany,' April 1885) on Continuity in several species of *Fucus*. By the employment of a number of refined processes, Hick has satisfied himself that continuity throughout the tissues of these types may obtain in either of four ways:—(i.) Through a comparatively wide and open pore; (ii.) by the interposition of a sieve-like diaphragm; (iii.) by means of a single ribbon of protoplasm passing through a long and narrow slit in an otherwise impervious diaphragm; (iv.), as (iii.), but the ribbon reduced to a mere filament transmitted through a minute pore in the diaphragm.

DESCRIPTION OF THE PLATES.

Plate XIX.

Fig. 1. An endosperm-cell of *Strychnos Ignatia* swollen up in water. (*h* in this and the following figures marks the primary wall of the cells.) × 450.

2. Piece of endosperm of the same treated with solution of iodine in alcohol and then with a small quantity of water. × 600.

3. The same, but after addition of water, showing nodules upon the intramural threads. × 600.

Fig. 4. The same, after exhibition of solution of iodine in alcohol: the cell has been swollen up in water; plasmolytic threads remain as a fray upon the edge of the protoplasm. × 600.

5. The same. View of wall, from above, showing the debouching points of the intramural threads. × 600.

6. The same. Epidermis and underlying cells treated with water. The section was taken in a plane parallel to the axis of growth. × 140.

7. The same. A subepidermal cell after lying twenty-four hours in chlor-iodide of zinc. × 600.

8. *Strychnos potatorum.* Continuity of the protoplasm of two endosperm-cells. Chloriodide-of-zinc preparation. × 600.

9. The same. Cells swollen up in water. × 600.

10. *Strychnos spinosa.* Small portion of section of endosperm treated with solution of iodine in alcohol. × 600.

11. Section through the short cells of the endosperm of *Diospyros embryopteris*, showing continuity of their protoplasm through the walls; after lying in chloriodide of zinc for twenty hours. × 600.

12. The same, after twenty-four hours' action of chloriodide of zinc; the threads stained with picric blue. × 600.

13. A long cell of the same, treated similarly to the last: plasmolytic threads visible at one point. × 600.

14. Rift in the wall of the same. × 600.

15. A small portion of the wall, from above. × 600.

16. *Strychnos Nux-vomica.* The lumen of the two endosperm-cells showing plasmolytic threads passing into intramural ones, thus demonstrating continuity. After action of solution of iodine and alcohol and subsequent treatment with a small quantity of water. × 600.

PLATE XX.

Fig. 17. Plasmolytic threads from endosperm of *Strychnos Ignatia*; and fig. 18, from that of *S. potatorum.* Same treatment as the last. × 600.

19. Pectinate appearance produced by the pits in the wall of the endosperm-cells of *S. potatorum.* × 600.

20. A stellate cell from the tetraspore-bearing process of *Chondrus mamillosus*, its lumen reduced to a mere point of junction. × 600.

21. Larger cells from the same, showing direct continuity. × 600.

22. Transverse section of a portion of the frond of *Polyides rotundatus*, showing direct continuity. Not drawn to scale.

23. The same. Connection between a granuliferous cell and one of the long cells of which the centre of the frond is largely made up. × 600.

24. The same. Direct continuity between two of the small cells at the surface of the frond. × 900.

25. *Ceramium rubrum.* *a.* Two of the axial cells, showing continuity of their protoplasm through small perforations in the membrane of a ring: one of the cells has two crystalloids, the other a single one. *b.* A ring, from above; it shows a highly refractive edge and perforated membrane. Glycerine preparation. × 600.

26. The same. *a.* A ring showing division of the threads in anticipation

of their passage through it (glycerine preparation). *b.* A ring from the front, showing threads passing through it. Such a view as the last can only be gained by a great deal of focusing (chloriodide-of-zinc preparation). × 600.

Fig. 27. The same. Apparent direct continuity of the small outer cells. The parietal protoplasm lies as a dense highly refractive layer upon almost the whole of the wall. × 600.

28. Connection between the short cells, isolating and the long cells lying in the chambers of *Chylocladia articulata*. Not drawn to scale.

29. Rings between the long cells of the same, from above. From sections dyed with Judson's Oxford blue. × 600.

30. Continuity through the rings between the chamber-isolating cells of the same. From a section treated similarly to the last. × 600.

31. *Callithamnion* sp. (*a*) A tip of a branch showing divided nuclei, achromatin fibres, and a commencing cell-plate. × 600. (*b*) A smaller tip than the above, the cell-wall fully formed, the protoplasm in continuity by means of a fine thread, at either end of which is placed a highly refractive piece of protoplasm. Chloriodide-of-zinc preparation. × 450.

32. Cell-junctions of the same, further developed. The rupture of the ring (fig. *b*) has brought into view several fine threads issuing from its membrane. Fig. *a* × 450, fig. *b* × 600.

33. *Ptilota sericea*. A small ring from a branch shortly before cortication; perforated membrane already developed. Chloriodide-of-zinc preparation. × 600.

34. Connection between axial cells near the bottom of the frond of the same: *a*, in longitudinal, *b*, in transverse section. × 450.

35. *Delesseria alata*. View of the membrane-closed bottom of a large cell, from above, showing a large primary ring and circumferential secondary rings. × 450.

PLATE XXI.

Fig. 36. The same. Cell-junction in longitudinal section. × 450. In this and the last: *p*, primary ring; *s*, secondary ring; *m*, membrane.

37. Division of protoplasm in passing the rings of the same. The dark line on either side of the ring in fig. *a* is the primary ring. × 450.

38. The same. Rings, from above. × 600.

39. A small, apparently simple ring, between two of the large cells of the same. × 450.

40. A membrane from a ring, showing two small rings near its centre. × 450.

41. A primary ring with small secondary rings interposed between two of the cells which surround the large cells of *Delesseria alata*. From a preparation placed for eighteen hours in chloriodide of zinc. × 450.

42. Row of long cells from which the midrib of *Delesseria alata* is built up. The uppermost came fourth in order behind the scutcheon-shaped cell formed by division of the third demilune cell. The second cell is preparing for division; it is connected with its fellows by a fine

nodule-bearing filament. The third cell has just divided, and the nodule-bearing filament has not yet put in an appearance. The lowermost cell has already divided. Chloriodide-of-zinc preparation. × 600.

Fig. 43. Wide cells of the same in an early condition, some distance below the growing-point; at least three nodule-bearing threads are visible through the incomplete wall of partition. × 600.

44. A ring at the stage of fig. 43, showing the small slimy membrane and three apparently open secondary rings. × 450.

45. *Polysiphonia nigrescens.* A ring interposed between the axial cell and a cortical siphon, showing division of the protoplasm in passing it. × 600.

46. An axial-siphonal ring, from above. × 600.

47. Longitudinal section through the junction of two axial cells of the same, showing a large primary ring with secondary rings. × 300.

48. The same in transverse section, showing a large part of the bottom of a cell covered in with membrane, upon the circumference of which secondary rings are here and there to be seen. × 450. (The wall of this has been drawn rather too thick, and at the expense of the membrane.)

49. Connection between the axial cell and a small cell in the neighbourhood of the siphons. There were twenty siphon cells in this section. × 450.

50. Ring between two siphons of the same, showing division of the protoplasm before reaching it. × 450.

51. Protoplast from an axial cell of *Polysiphonia fastigiata*, showing a ring wth perforated membrane. From a teased preparation previously boiled in caustic potash, and subsequently stained with chloriodide of zinc. × 450.

52. Half-profile view of a ring of *Halurus equisetifolius*, obtained in longitudinal section of the corticated part of a branch. × 450.

53. Membrane of a small ring between the ultimate and penultimate cell of a branch of the same. The preparation was boiled in caustic potash and stained with picric blue. × 600.

54. *Ballia callitricha.* View of the junction of two axial cells of a branch before cortication has advanced to them. × 450.

55. The same, showing fine threads of protoplasm attached to the circumference of a stopper, the intercellular pit filled with membrane &c. Drawn with Hartnack's No. 8 objective, ocular No. 4, but not to scale.

56. Two stoppers with threads of protoplasm piercing the pit-closing membrane. (Chloriodide-of-zinc preparation.) × 450.

57. Longitudinal section of a corticated part of a branch of the same, showing a greatly enlarged stopper; from it the protoplasm extended as a wide band to the stopper in the floor of the cell. × 450.

58. Apex of a slender branch. The stoppers are represented by a piece of highly refractive protoplasm at either end of the unclosed protoplasm-filled pit. × 600.

59. Part of a siphon-cell of *Polysiphonia nigrescens*, showing reticulate protoplasm on its wall. × 600.

Fig. 60. Junction of three long cells of *Chylocladia articulata.* The protoplasm has collected at the top of one of them. × 600.

61. *Halurus equisetifolius.* Meeting-point of two young cells. A dense layer of protoplasm lines the intercellular wall at each side. × 140.

62. Two axial cells of *Ceramium rubrum.* The protoplasm runs in the form of a hollow tube from stopper to stopper. × 140.

STUDIES IN VEGETABLE BIOLOGY.—II. On Rosanoff's Crystals in the Endosperm-Cells of *Manihot Glaziovii*, Müll. Arg. By SPENCER LE M. MOORE, F.L.S.

[Read 2nd April, 1885.]

THE existence of crystals fixed to the wall of their containing-cell and themselves enclosed in an investment of cellulose appears to have been first noticed by Schacht [*], who described in some detail the large single crystals found in the leaves of *Citrus vulgaris.* A few years afterwards Rosanoff [†] wrote his well-known memoir on the Crystal-masses in the pith of *Kerria japonica* and *Ricinus communis*, and in the petiole of several Aroideæ and the floral organs of *Encephalartos* and *Nelumbium*; he showed that the crystals are either directly fixed to the wall of the cell and surrounded by a cellulose investment, or, still retaining the investment, are pedicellate upon the wall. Similar crystals were found by De La Rue [‡] in the leaves of *Hoya carnosa.* Pfitzer [§], working over Schacht's ground, very elaborately monographed the crystals of *Citrus* which he found not in the leaves alone, but in their stalks and in the stem: he further proved that they are not, as Schacht had supposed, of sulphate, but of oxalate of lime; and he made a careful microchemical investigation of the supporting pedicels. He also discovered that at an early stage the crystal can be seen lying freely in its cell surrounded by a nimbus of protoplasm. Besides this, Pfitzer showed that the crystals met with in the cortical parenchyma of *Salix aurita, Populus italica*, and other trees are secured to their cell-wall by thick deposits of cellulose. Poulsen [||] subsequently wrote a paper on the pedicellate sphere-crystals surrounded by cellulose of Rose-berries;

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[*] Abhand. Senck. Gesell. z. Frankfurt, i.

[†] Bot. Zeit. 1865 and 1867

[‡] Bot. Zeit. 1869.

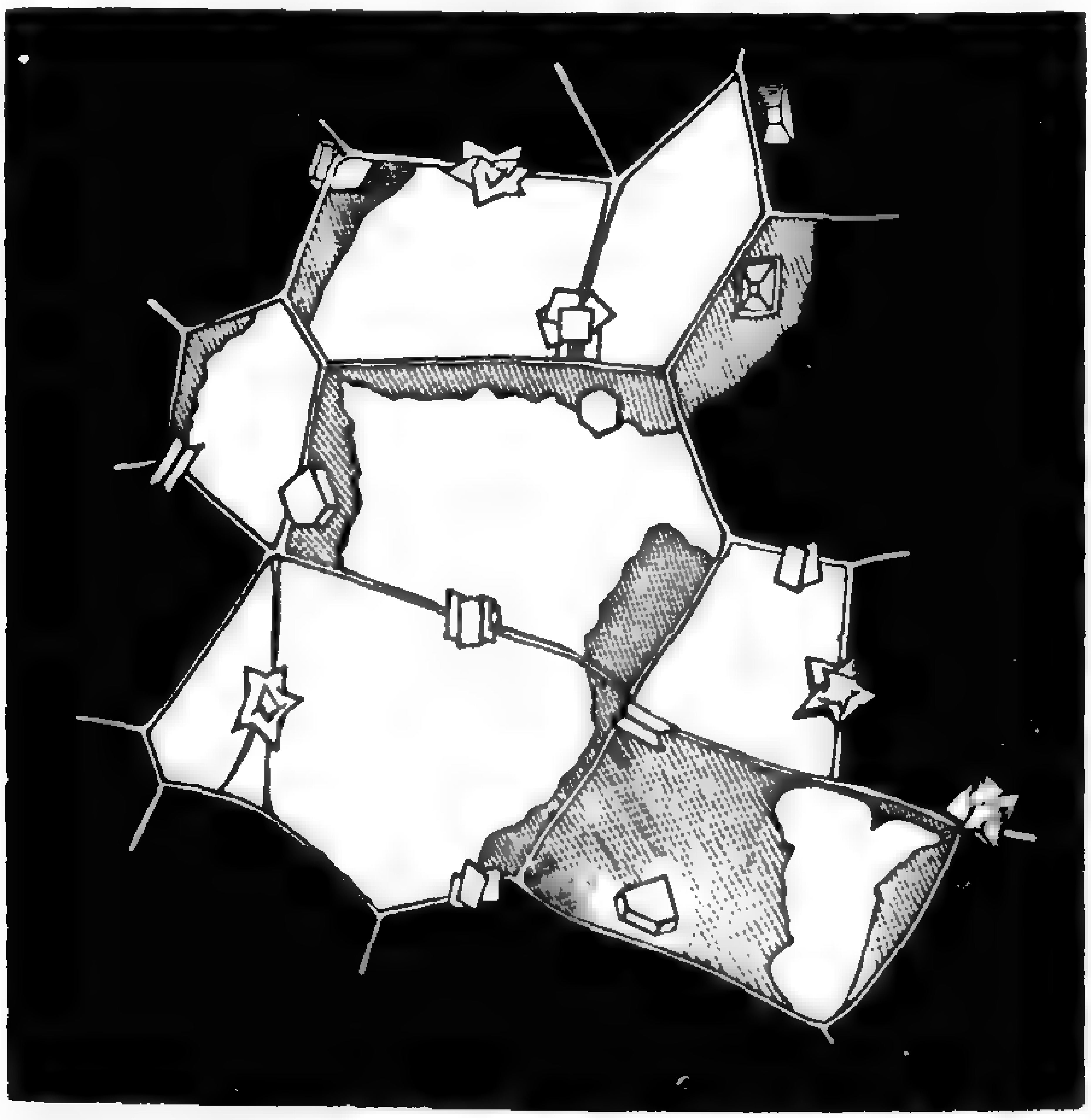
[§] 'Flora,' 1872. A short account of the crystals is given by De Bary in his 'Vergleichende Anatomie' (p. 147).

[||] Vidensk. Medd. Naturhist. For. Kiöbenhavn, 1874.

and again* on the single similarly surrounded crystals, which he was the first to observe in the fundamental tissue, bast-parenchyma, petioles, &c., of various Phaseoleæ. It is scarcely necessary to say that crystals merely attached to the cell-wall are not included in the category of Rosanoff's crystals, the essential feature of which consists in the relation between them and a support of cellulose developed from the cell's wall.

It will be observed that up to the present time organs in the full tide of vegetation have been the home of these crystals; the announcement of their discovery in a resting tissue has now to be made. On freeing sections of the endosperm of *Manihot Glaziovii*, Müll. Arg., of their oil with ether or alcohol, and washing away, as far as is possible, the closely packed aleurone-grains, the walls of the cells are seen to be everywhere studded with single, twin, and sphere-crystals of small size. Fig. 1 gives a general view of the tissue under a moderate power. The chief forms assumed by the crystals are as follow:—

Fig. 1.



General view of oil- and aleurone-freed endosperm tissue of *Manihot Glaziovii*. × 450.

(1) Clinorhombic crystals, sessile, or shortly pedicellate upon wall (fig. 1); truncation is sometimes carried further than is here represented. The size varies considerably.

(2) Sphere-crystals fixed directly to the wall or on short pedicells, or occasionally supported on narrow bars running across the lumen of the cell. These spheres differ greatly in size; they

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* 'Flora,' 1877.

are frequently placed at the meeting-angles of the cells. They may be composed of small pyramids with blunt apices, or of a greater or less number of flat plates, or of clinorhombic crystals, or of a medley of the above. The masses are sometimes greatly reduced, as is shown at fig. 2, which represents a sphere-mass made up of a clinorhombic crystal capped by two small pyramids.

Fig. 2.

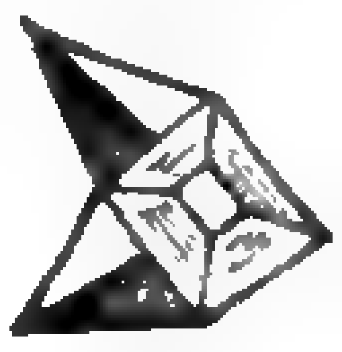

Fig. 3.

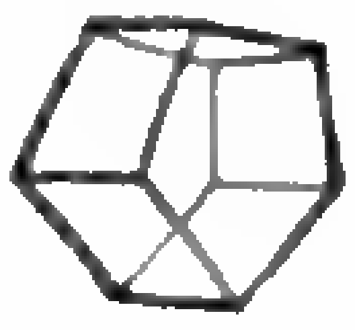

Fig. 2. Small sphere-crystal, composed of a clinorhombic crystal.

Fig. 3. Cellulose skeleton investing a five-sided prism. From a preparation treated with hydrochloric acid. × 600.

(3) Five- (occasionally six-) sided short prisms with plane faces. These are best studied in sections treated with hydrochloric acid, which dissolves out the crystal, leaving a delicate skeleton of cellulose (fig. 3). It often happens that the angles of these crystals are not well developed.

(4) Twin crystals are of frequent occurrence (fig. 1), and occasionally mulberry-masses (the crystals composing which are exceedingly small) are to be found.

These crystals are in various ways surrounded and attached to the wall by cellulose. Examples of this attachment are drawn

Fig. 4.

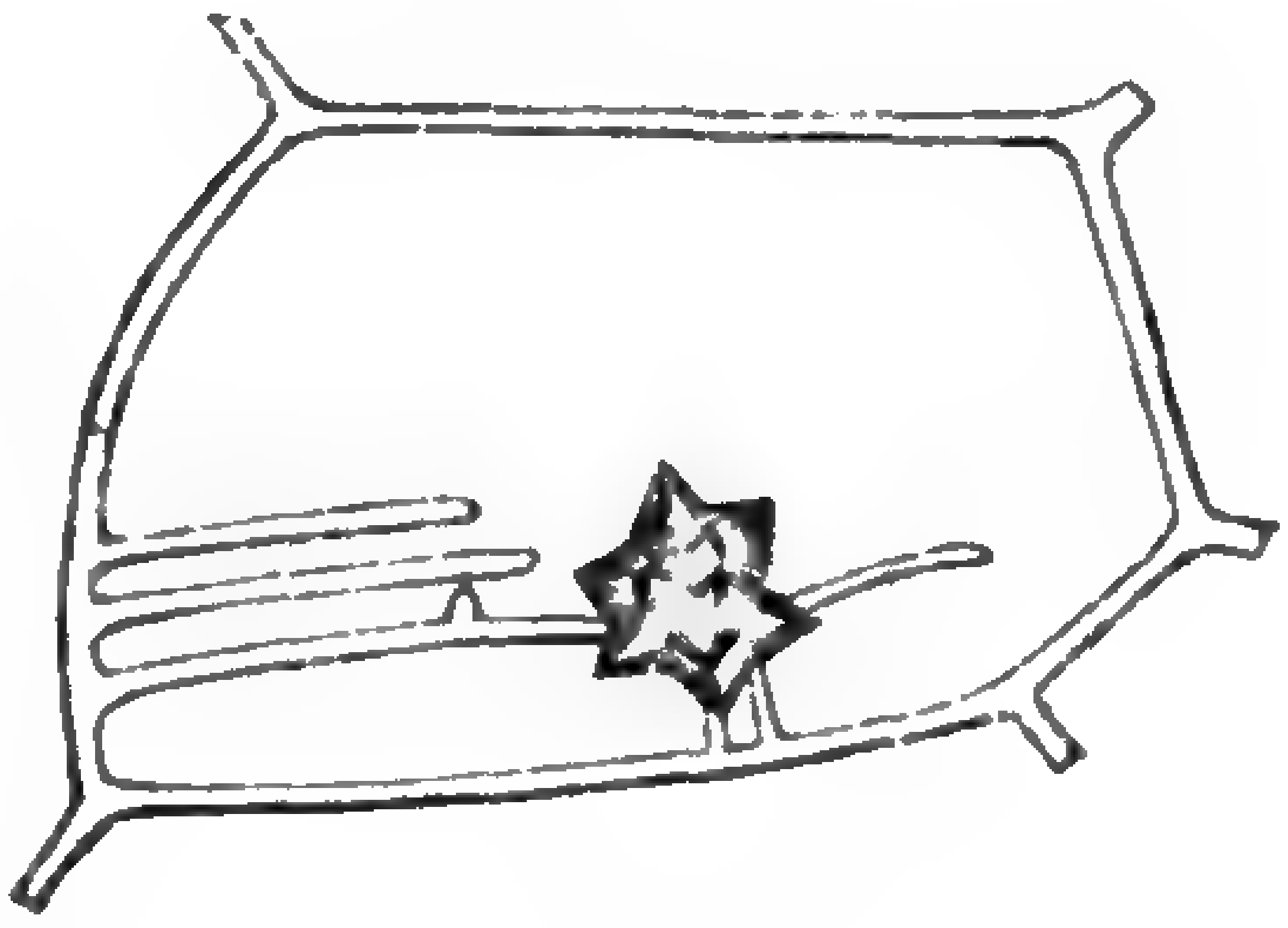

Fig. 5.

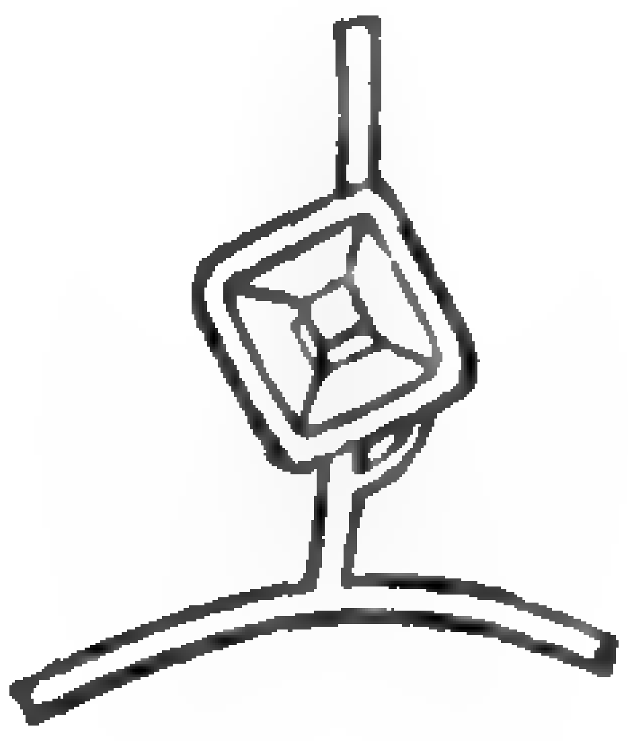

Fig. 6.

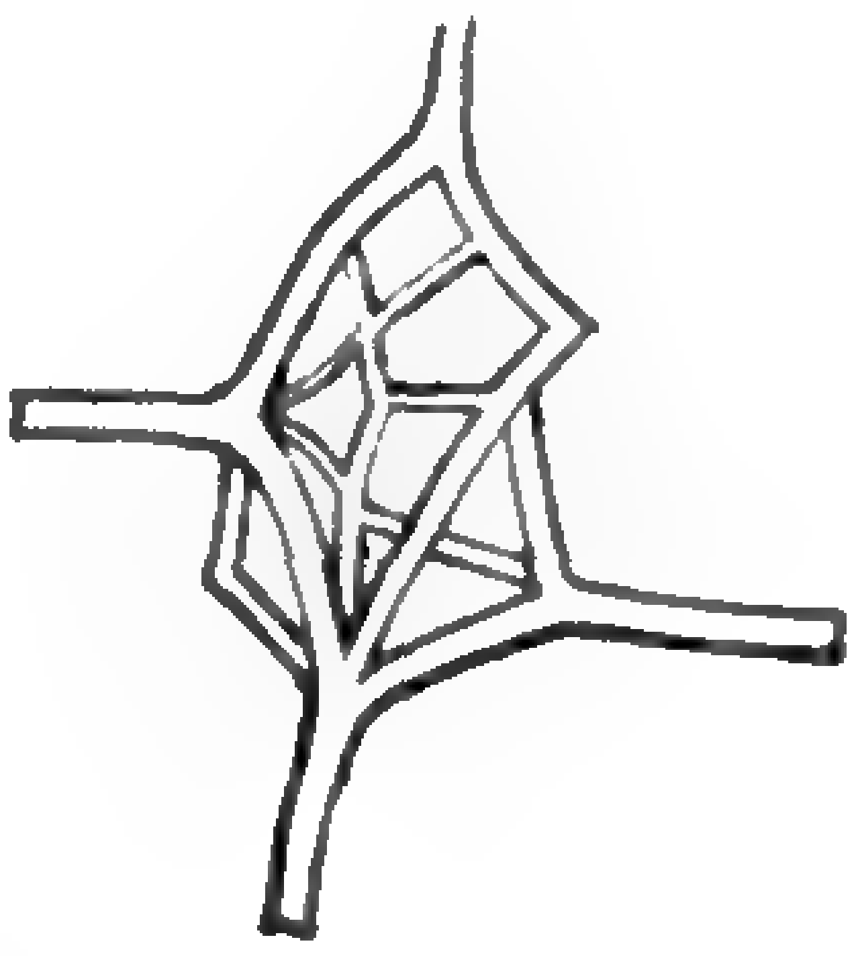

Fig. 7.

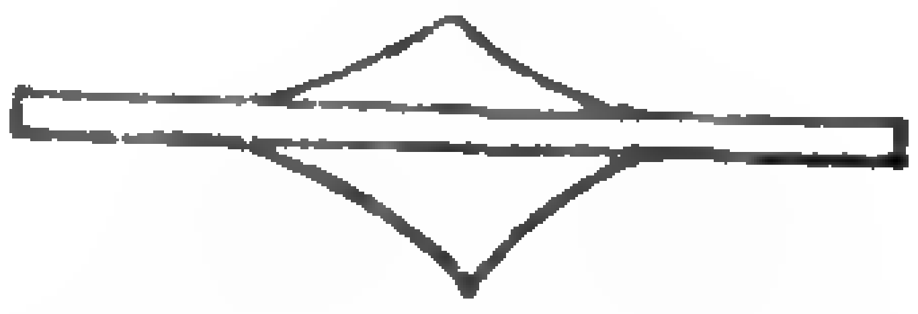

Fig. 8.

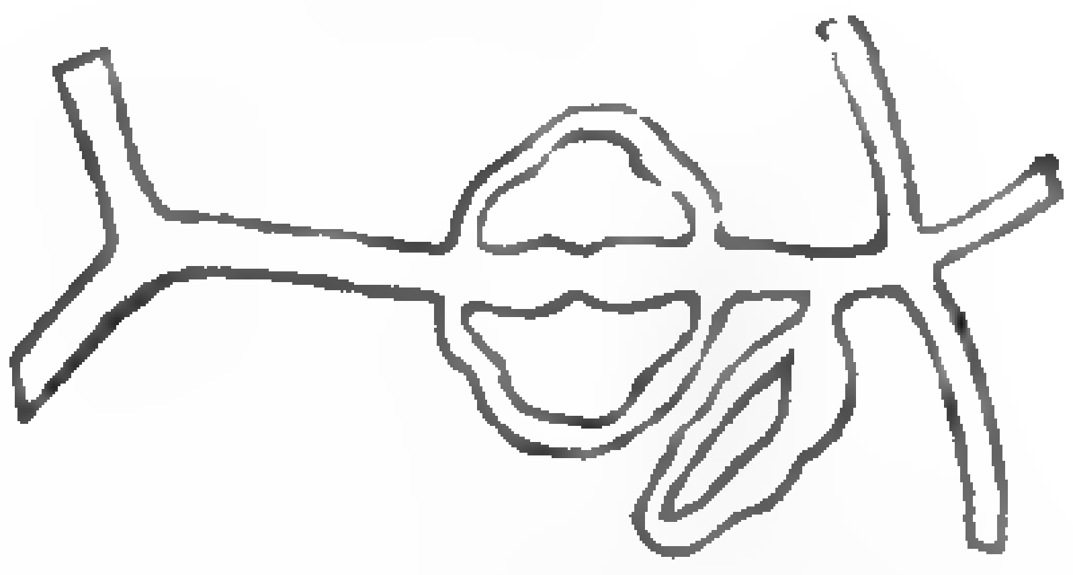

Fig. 4. A single cell, showing a shortly pedicellate sphere-crystal, the cellulose bands in association with it stretching some way across the lumen of the cell. ×600.

Fig. 5. A clinorhombic crystal in a well-developed investment of cellulose × 600. And two pyramids, × 600.

Figs. 6, 7, and 8. Cellulose investment of crystals dissolved in hydrochloric acid. × 600.

in figs. 4 and 5 and 6–8; the last three after dissolution of the crystals in hydrochloric acid. Fig. 6 represents the investment of a large sphere-mass at the junction of four cells; the support is thicker in fig. 7; in fig. 8 it is exceedingly delicate.

The crystals are composed of oxalate of lime; they are also doubly refractive. The investing support, if it swells up at all in chloriodide of zinc, does not do so to any appreciable extent: from a mixture of aniline rose and violet, it selects the former, showing that it has somewhat of the character of collenchyma.

Similar crystals are found in the tissues of the embryo; but whether they occur in the adult tissue, I cannot say. Mr. Scott, in his memoir on the latex canals of this species*, speaks of clinorhombic and sphere-crystals, but is silent as to their attachment to the wall and investment with cellulose.

My best thanks are due for aid in prosecuting the above researches to the Kew authorities, especially Mr. John R. Jackson, Curator of the Museums, who has been good enough to supply me with seeds; to the Royal Microscopical Society, whose Assistant Secretary, Mr. West, has been very helpful; to Mr. E. M. Holmes, for kindly assisting in the determination of species and communicating specimens of Florideæ; lastly, to Messrs. Fletcher and Davies, of the Mineralogical Department, British Museum, for obligingly looking at my preparations of the endosperm of *Manihot Glaziovii.*

On Vernation and the Methods of Development of Foliage, as protective against Radiation. By the Rev. GEORGE HENSLOW, M.A., F.L.S., F.G.S.

[Read 4th June, 1885.]

IN his work on 'The Movements of Plants,' Mr. Darwin says:—"The fact that the leaves of many plants place themselves at night in widely different positions from what they hold during the day, but with the one point in common, that their upper surfaces avoid facing the zenith, often with the additional fact that they come into close contact with opposite leaves or leaflets, clearly indicates, as it seems to us, that the object gained is the protection of the upper surfaces from being chilled at night by radiation."†

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* Quart. Journ. Micros. Sc. 1884.

† P. 284.

He further adds*:—"We exposed on two occasions during the summer to a clear sky several pinned-open leaflets of *Trifolium pratense*, which naturally rise at night, and of *Oxalis purpurea*, which naturally sink at night (the plants growing out of doors), and looked at them early on several successive mornings after they had assumed their diurnal positions. The difference in the amount of dew on the pinned-open leaflets and on those which had gone to sleep was generally conspicuous; the latter were sometimes absolutely dry, whilst the leaflets which had been horizontal were coated with large beads of dew. This shows how much cooler the leaflets freely exposed to the zenith must have become than those which stood almost vertically, either upwards or downwards, during the night.

"From the several cases above given, there can be no doubt that the position of the leaves at night affects their temperature through radiation to such a degree, that when exposed to a clear sky during a frost it is a question of life and death."

It is the object of the present communication to show that many, perhaps the majority of, leaves as they develop on the expansion of buds in spring assume the same positions as leaves of those particular plants which are remarkable for sleeping at night, and appear to exhibit a similar care, but in a more perfect way, in protecting the upper surfaces; and the inference to be drawn from all the phenomena presented by young growing leaves, as it seems to me, is the same, namely, to shield their upper surfaces especially from injury caused by radiation, viz. chill and desiccation. Moreover, it is not an unusual thing for the young leaves only to be subject to hypnotism, the older ones ceasing to rise and fall by day and night: thus Mr. Darwin mentions *Melilotus* as an instance; and I find it is the same with the French Bean. Lastly, experiments made to test this theory are decidedly corroborative.

Vernation, as explained and illustrated in text-books on Botany, is solely concerned with the various methods by which the rudimentary leaves are folded up in the buds of different plants; and the internal wooliness, as well as external resinous matters &c., are usually regarded as being safeguards against injury to the buds within from the severity of winter weather. Beyond that surmise, I am not aware that any attempt has ever been made to offer any *rationale* of the processes of vernation; nor has any one noticed the special behaviour of developing leaves and stipules, as well as of the axes and petioles which support them. If, however, we keep in view the two assumed objects—first, the securing an erect or dependent position of the blades so as to place their surfaces in a plane at right angles to the surface of the earth; and, secondly, the protection of the upper surfaces,—it will be seen how various are the efforts of nature to secure these two ends during the period of development, and while the young leaves and shoots are succulent and delicate, such being only too readily and often severely injured by the cool nights, sharp frosts, and cutting winds of spring, at the very time when the buds are expanding. The various methods of protection are more perfect than in sleeping plants, inasmuch as the young leaves are more delicate than when adult. Testing the effects of desiccation by the heat of the sun, I found that when young clover-leaves naturally conduplicate were forcibly spread out with the upper surfaces exposed to the sun for twenty minutes, the edges soon curled inwards, and they lost 37·2 per cent. of weight. Those spread out with their under surfaces exposed remained flat, but lost 43·2 per cent. of weight in the same time, *i. e.* rather more than the preceding. In all experiments with clover-leaves exposed at night, I found the differences were not so pronounced as in many other plants.

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* Pp. 293, 294.

In observing the effects of frost upon delicate leaves one sees that they are especially injured along the margins; and, moreover, where so affected, they are more or less dried up. The first fact gives a significance to the revolute and involute kinds of vernation, in which the margins are rolled outwards and inwards respectively. This led me to suspect that whenever leaves suffered from radiation, not only was there a reduction of temperature, but a loss of moisture would seem to accompany the loss of heat. A similar loss of moisture would occur by desiccation, in consequence of cool dry winds, and must be equally guarded against. If this were so, then the balance would indicate the loss. With this object in view, I weighed a number of undeveloped leaves together of several plants, and made two groups of each, selecting leaves as nearly like as possible for each group of the same plant. I then, following Mr. Darwin's method, fixed all of one group with their upper surfaces exposed upwards with card-clips, such as are used by entomologists for spreading out the wings of butterflies; the other group of leaves were laid on cork with their leaflets naturally conduplicate or otherwise protected as in nature. In the morning I weighed each group again, and reduced their losses to percentages of the original weights of each group respectively. I found that there was in every case a generally much greater loss in the case of the leaves artificially exposed than with the others, as will be seen from the following examples:—

		Loss p. c.		Loss p. c.
Laurustinus,	exposed naturally	8·7.	Spread out,	18·7
Portugal Laurel	„ „	8·4	„	12·6
Lime	„ „	4·5	„	21·4
Laburnum	„ „	14·8	„	33·0
Ash	„ „	2·3	„	11·8
Rose	„ „	10·6	„	17·6
Periwinkle	„ „	5·0	„	12·05
Clover	„ „	24·4	„	29·3
Walnut	„ „	18·7	„	24 6

Very few nights of the last month (May) were frosty, so that several attempts to carry out experiments were unsatisfactory, as so many nights were cloudy, windy, and stormy, and ill-suited for radiation; yet on one occasion, when about three degrees of frost occurred, the Walnut, Lime, and Laburnum leaves when spread out showed to the eye unmistakable injury; whereas these three kinds of leaves, placed as they occur on the trees, did not appear to be hurt. Other leaves treated in the same way and subjected to the same slight frost did not *appear* to have suffered; but I had not at that time thought of weighing them.

I will now add a selected series to illustrate the various methods adopted whereby the young and developing leaves are protected from injury by radiation.

I. Simple Leaves. (1) Opposite: (i) *erect.*—This position is assumed in all cases of opposite leaves which I have had an opportunity of examining. The leaves face one another with their upper surfaces more or less in close contact, concealing the bud between them. In shrubby Veronicas and Hypericums and Periwinkle the leaves are almost, as it were, glued together, so firmly do they cohere all round the margins. In others, such as *Aucuba* and *Laurustinus*, they are more slightly adjusted. The only exceptions that I have met with were Snowberry, *Weigela*, Honeysuckle, and the leaflets of the Elder, all being of the same family, Caprifoliaceæ *. The pairs of leaves had their edges involute, and one of each pair slightly embraced the opposite leaf, and so wrapped up the bud within it.

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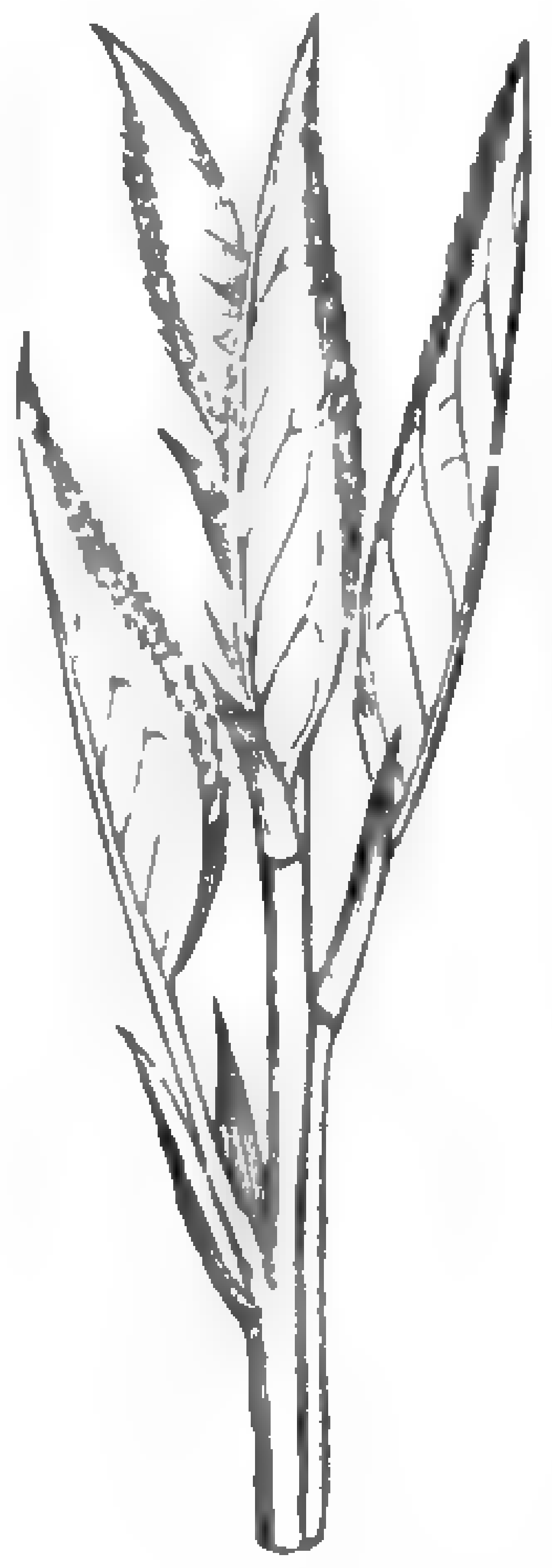
* I first discovered this difference in *Weigela*, and that led me to examine the others, which revealed the fact that this peculiar form of vernation is an ordinal character.

(ii) *pendulous.* I have not met with any instance of opposite leaves being pendulous in the young state.

(2) Alternate: (i) *erect.*—Good examples may be seen in the Common and Portugal Laurels. As the upper surfaces of different leaves cannot be in contact, issuing from separate nodes and at different elevations, each leaf is conduplicate, *i. e.* the two halves of the blade are folded together and thereby press their upper surfaces of the halves against one another; indeed so tightly is this done, that it is not at all easy, in any instances, to separate them. It may be noted here that the conduplicate vernation is an extremely common one both for simple and compound leaves, and the significance of it will be now very apparent. It is sometimes further complicated by having the surfaces plicate, as in the Vine, Beech, Maple, Currant, Raspberry, &c., conditions which are probably additional safeguards against radiation.

Fig. 1.



Portugal Laurel.

As other instances of the erect position may be mentioned Rhododendron, the leaves of which, as of the Dock and Primrose, are revolute; but those of the Violet, Pear, and Michaelmas Daisy are also erect but involute, while the Cherry has them convolute. In all these the undeveloped leaf is cylindrical or an elongated cone, erect, and offers no extent of surface, while the margins, the most sensitive parts, are specially protected.

(ii) *pendulous.* The Lime, Hazel, and *Ampelopsis Veitchii* are good examples. In the case of the Lime, as soon as the bud expands and escapes from the winter (stipular) scales, the inner stipules develop considerably: those on the upper side are concave and ovoid and cover the upturned edges of the conduplicate leaves, which at once take a position in a vertical plane; the stipules at the sides elongate much more than the former, furnishing some lateral protection to the whole bud, which now curves strongly downwards, and somewhat resembles a mussel in shape (fig. 2). As the bud continues to develop, the branch becomes more and more strongly curved downwards, so that the leaves are held vertically (figs. 3 and 4); and as the lower and older ones increase in size, they assume a horizontal position and undertake to protect the younger ones, which are concealed beneath them. Thus the protecting care is handed on to each leaf as it arrives at maturity, until the whole series are developed and the branch and leaves become horizontal.

The tile-like arrangement of the uppermost stipules and subsequently of the leaves themselves, thus protecting the edges of the vertically placed leaves beneath them, reminds one of a very similar method of protection in *Trifolium repens* when asleep. In this plant the two basal leaflets rotate so as to bring their upper surfaces in contact and their blades vertical, while the terminal leaflet revolves through 180° and comes down upon the upper edges like an arched roof above them * (figs. 5 and 6).

Fig. 2.

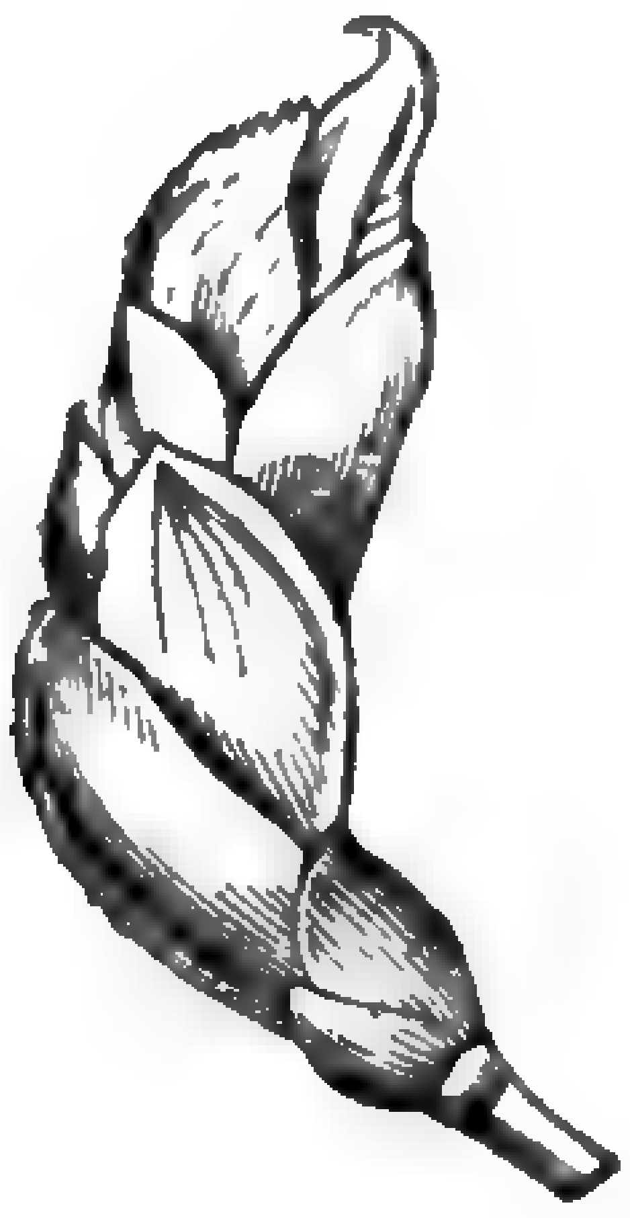


Fig. 3.

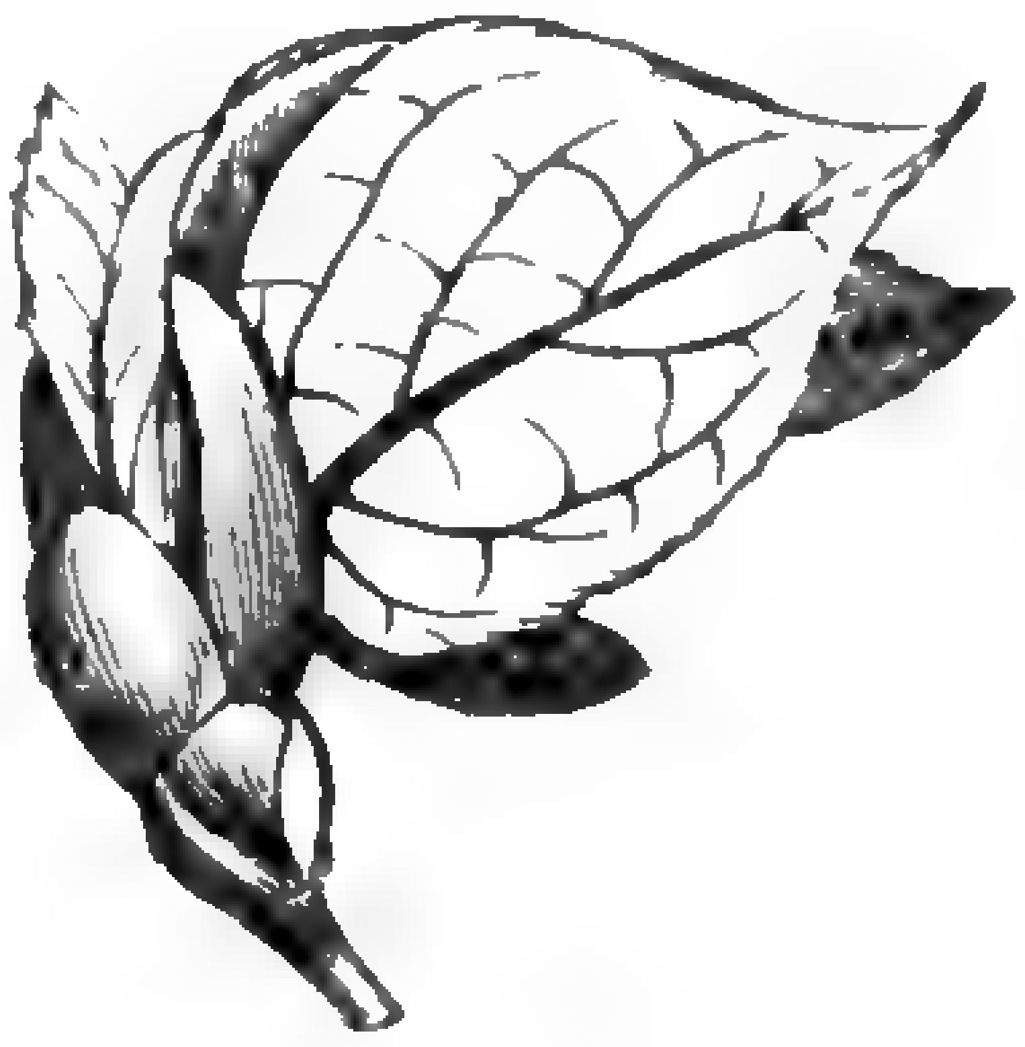
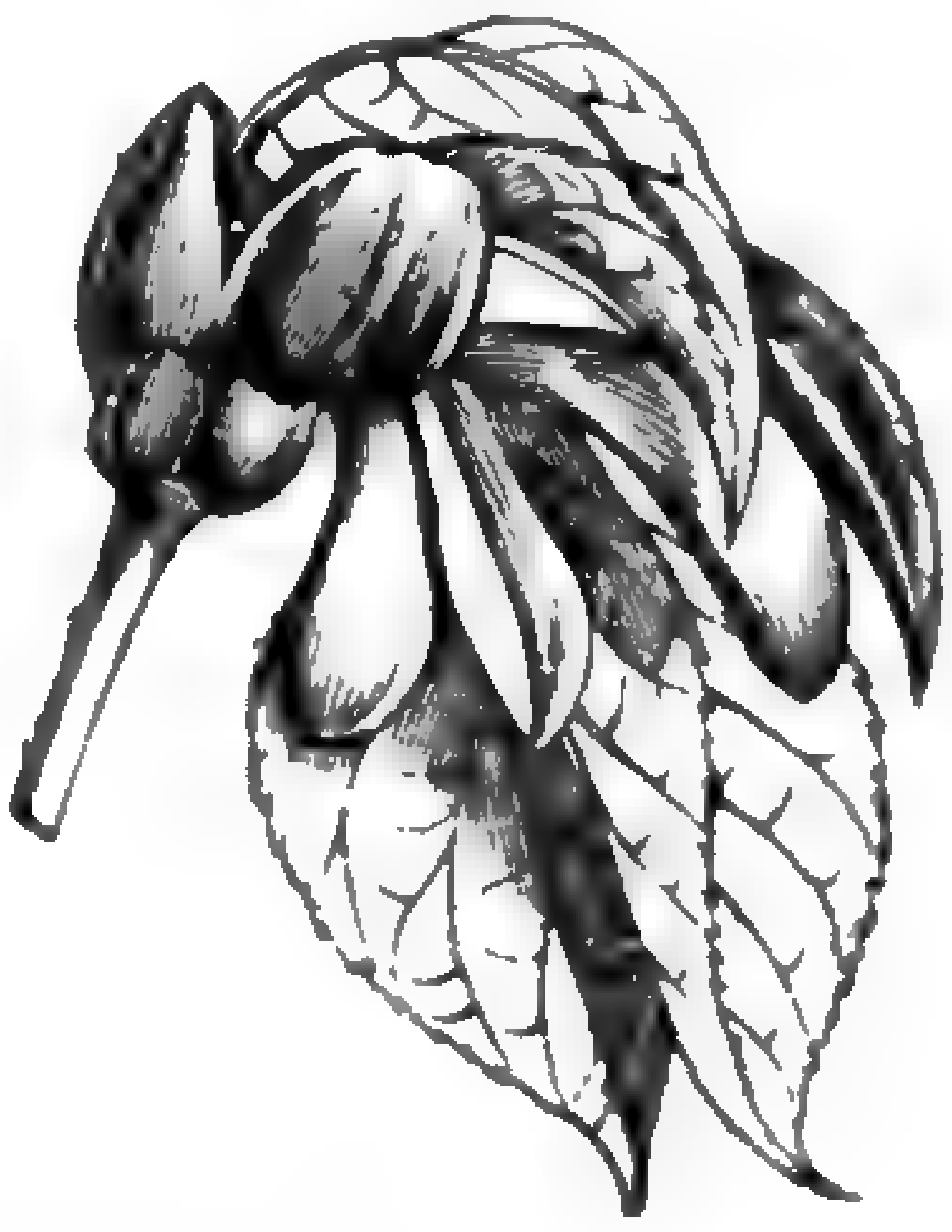


Fig. 4.



The Lime in different stages of development.

Fig. 5.

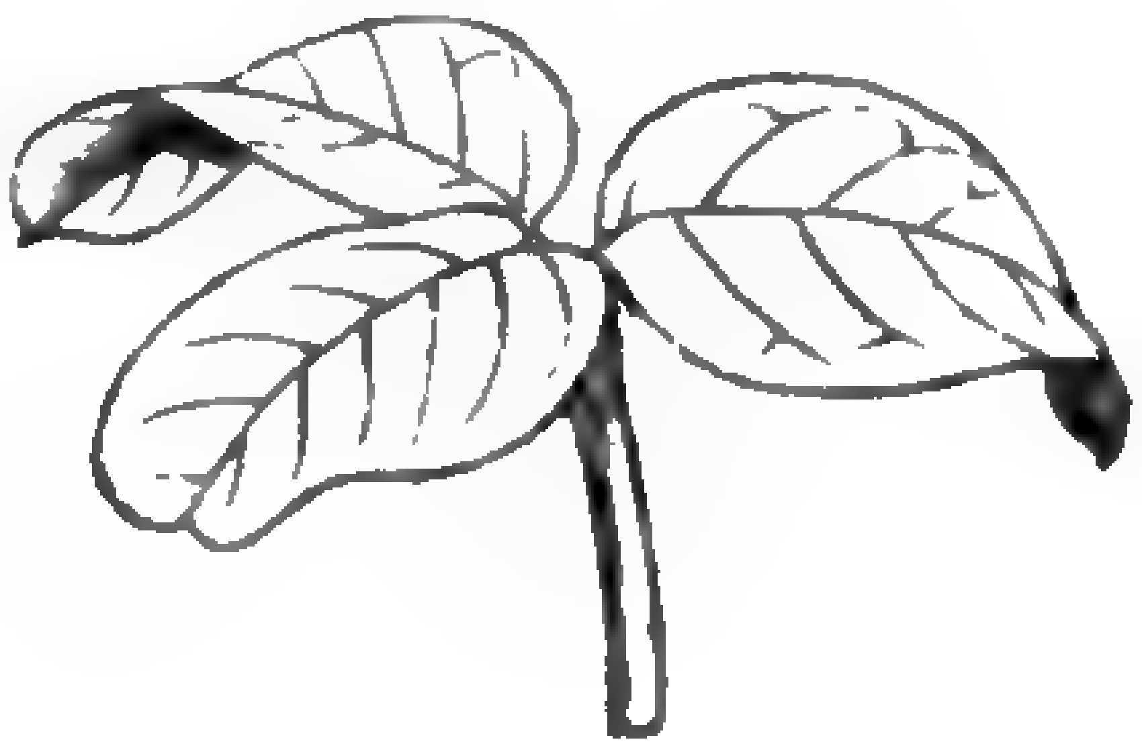
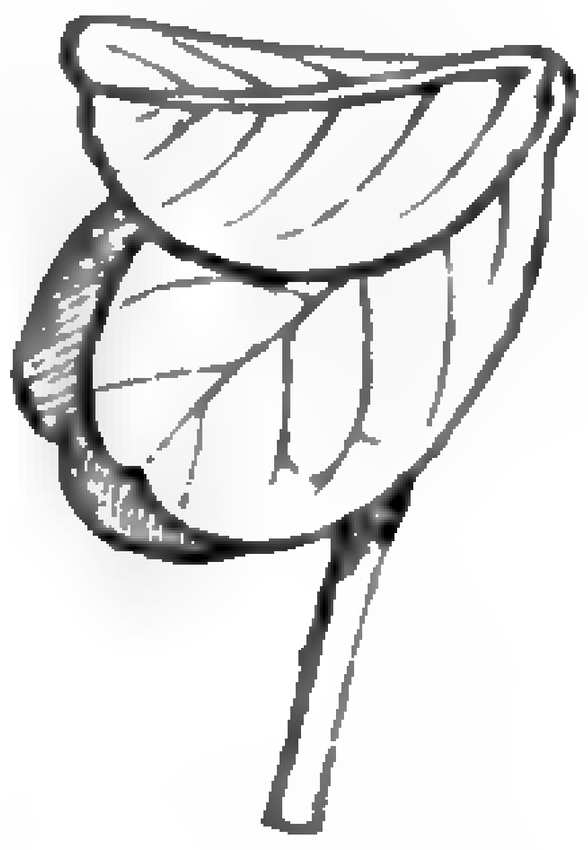


Fig. 6.



Trifolium repens.
Fig. 5. Leaf during day time. Fig. 6. Asleep, during night-time. After Darwin.

In the case of the Hazel the process is much the same, but with *Ampelopsis Veitchii* the blade spreads out at once, however young, and is not conduplicate; but as it hangs vertically from its very birth to its fall, it does not require any further protection beyond what the leaves above it happen to supply by overhanging it. The branches of this species cling so tightly to the wall that very possibly a good deal of heat is radiated from the wall itself on to the back, *i. e.* the underside of the leaf. The Beech differs from the Lime in having its young leaves dependent only and not protected. They are feebly conduplicate, but with a plicate surface, and the stipules do not form any protection; and, contrary to what takes place in the Lime, the older, basal leaves, instead of covering the younger ones, hang below them, the slender shoot curving at the apex so that the terminal and younger leaves have a tendency to be vertical, but not to so pronounced an extent as in the Lime. It may be noticed that the Beech does not open its buds till a later period than the Lime, and at a time when spring frosts are nearly over. The Spanish Chestnut agrees closely with the Beech, the leaves being at first subconduplicate, and similarly plicate, while each leaf on expansion is spread out below the terminal shoot. Both trees belong to the same section of the Cupuliferæ.

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* Darwin, Movem. of Plants, p. 349, fig. 141.

II. Compound Leaves. (1) Opposite: (i) *erect.*—The Ash and the Elder are illustrations. As with simple leaves, the leaflets of compound leaves are almost invariably conduplicate; the Elder, however, as stated above, having the margins of the leaflets involute as well. They all stand erect at first and only gradually assume the horizontal position on their complete development. The leaflets of the Ash are at first similarly clustered together, but simply conduplicate. With Weeping Ashes, in order to place the young leaves erect, the petiole is obliged to make a very strong curve upwards, not necessitated in the ordinary form of the tree.

(ii) *pendulous.* I have not met with an instance of opposite compound leaves being pendulous in the young state.

(2) Alternate: (i) *erect.*—Of compound leaves there are the two types, digitate and pinnate. Of the former, Lupin will illustrate this position. A specimen with white flowers had the leaflets all conduplicate at first and erect, forming a small but dense mass. Of the pinnate type with erect leaflets many instances might be mentioned, as, *e. g.*, Goutweed, Chervil, Sumac, Raspberry, and Rose. As a rule, besides being conduplicate and, in some cases, plicate in addition, the leaflets are all pressed together laterally, thereby affording a certain amount of mutual protection. This is well seen in the Rose.

In the case of the Rose the developing bud is protected by the adnate stipules (fig. 7), and the young leaf, when it merges, is at first erect (as in the Pea, figs. 8 and 9). The leaflets are conduplicate and all five pressed together laterally; for at this stage the petiole has not elongated sufficiently to allow of the pairs of leaflets being separated. As the petiole grows the whole collection of leaflets becomes more pendulous until they expand, and the leaf ultimately assumes the horizontal position. In the Garden Bean the leaves are conduplicate; but the margins are involute as well, so that the leaflets resemble so many quills.

Fig. 7.

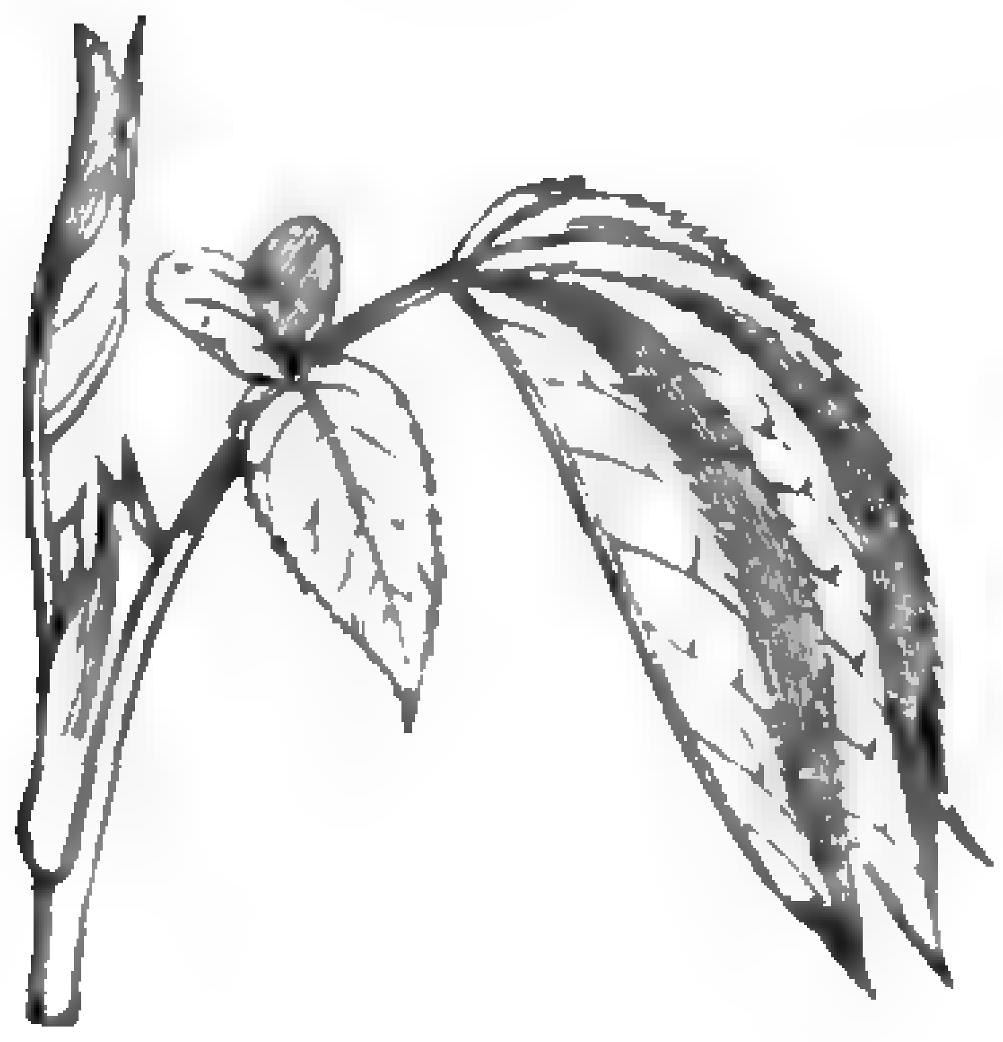


Fig. 8.

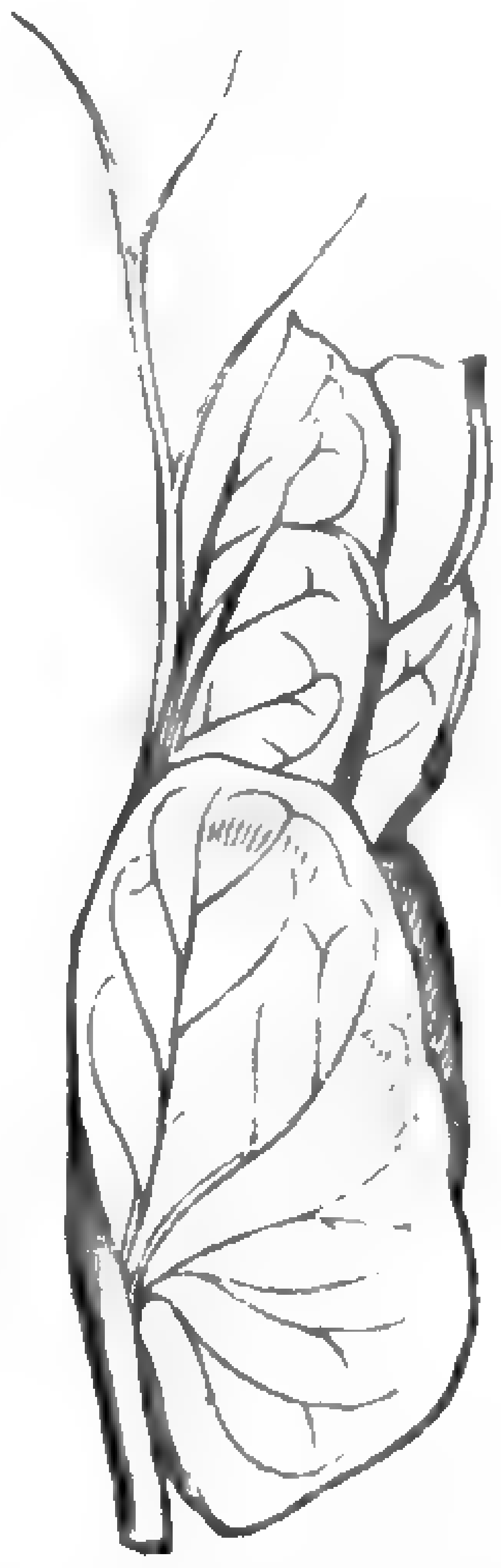


Fig. 9.

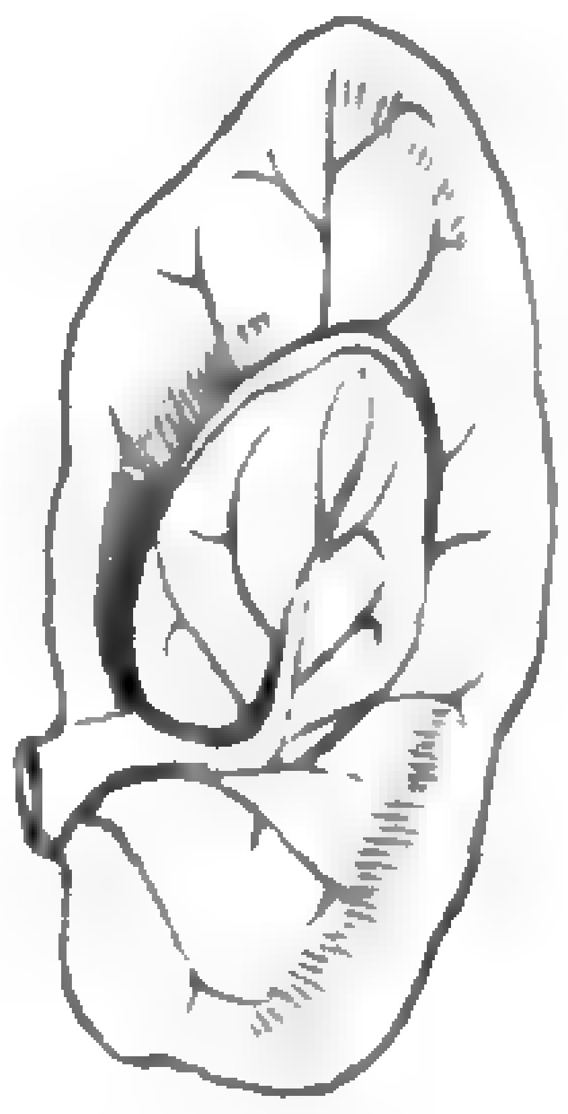


Fig. 7. Rose. Younger leaf erect; older with petiole curved and half-developed leaflets.

Fig. 8. Pea. Leaf emerging from between the stipules; the leaflets conduplicate.

Fig. 9. One stipule removed to show the erect bud within and protected by the stipules.

(ii) *pendulous.* Of the two types the following may be selected:— The French Bean, Wood-Sorrel (*Oxalis*), Clover, and Laburnum as being ternate, and the Horse Chestnut and Virginian Creeper as being digitate; while the Walnut will exemplify the pinnate type.

The French Bean (*Phaseolus vulgaris*) bears at first a pair of unifoliate leaves; but those which succeed them are ternate. While very minute in size (one half to three quarters of an inch in length) the leaf is horizontal, but the leaflets are conduplicate with their edges uppermost. When a little larger (say, one and a quarter inches) the petiole bends down angularly, and the leaflets are in vertical planes, holding identically the same positions as when adult and asleep. As they increase in size, the leaflets rise up and take a horizontal position. They now become subject to hypnotism, falling at night and rising again by day.

The Wood-Sorrel (fig. 12), Clover (fig. 11), and Laburnum (fig. 19) all agree in having their three leaflets conduplicate, pressed closely together laterally and suspended vertically. The petiole is suberect in the Laburnum and Clover, but strongly curved at the apex in the Wood-Sorrel, so that the minute leaf is under the concave end (fig. 12, *a* and *b*). When the leaf of the Oxalis is asleep, the leaflets fall vertically and bring their undersides in contact (fig. 2, *c*), but never resume the conduplicate condition again. The sleeping condition of Clover has been described above; but here, as in all other instances, conduplication once lost is never resumed *.

Fig. 10.

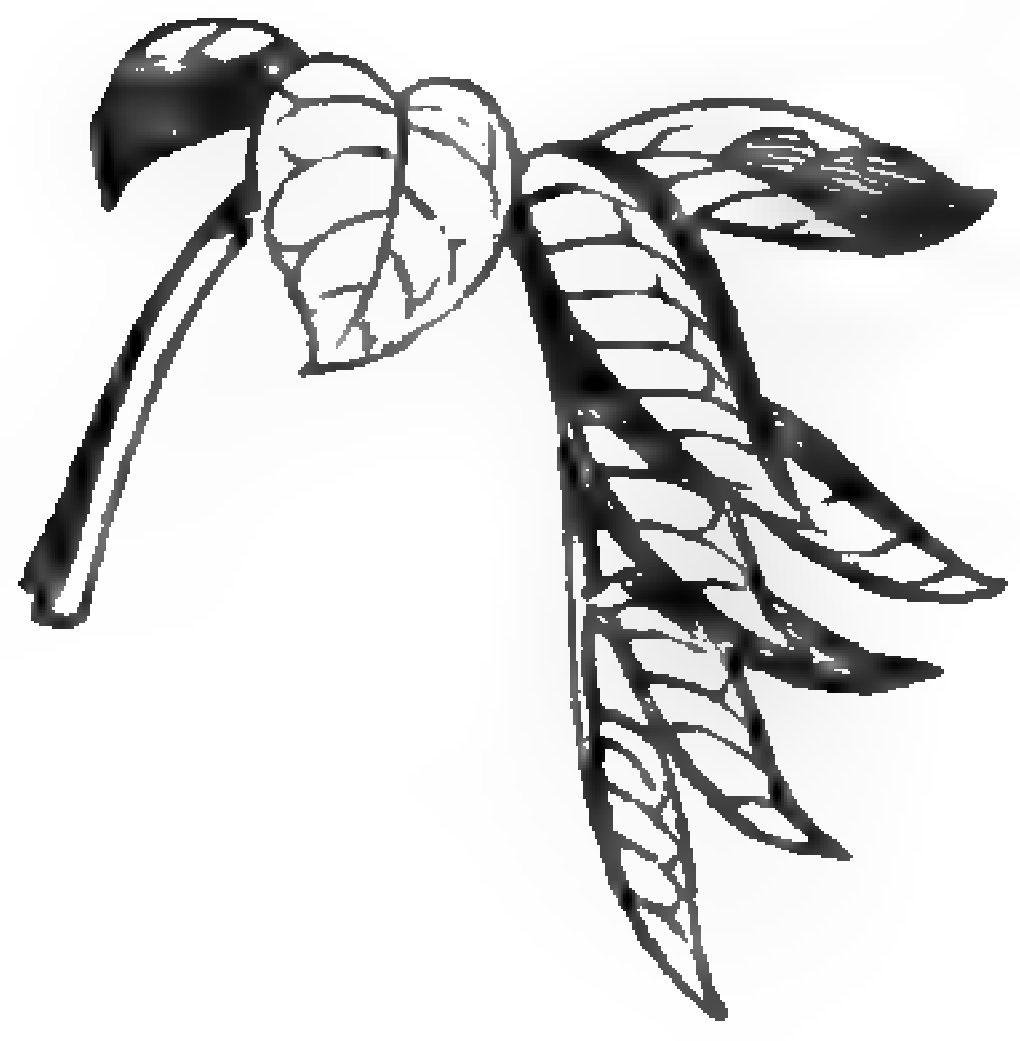


Fig. 11.

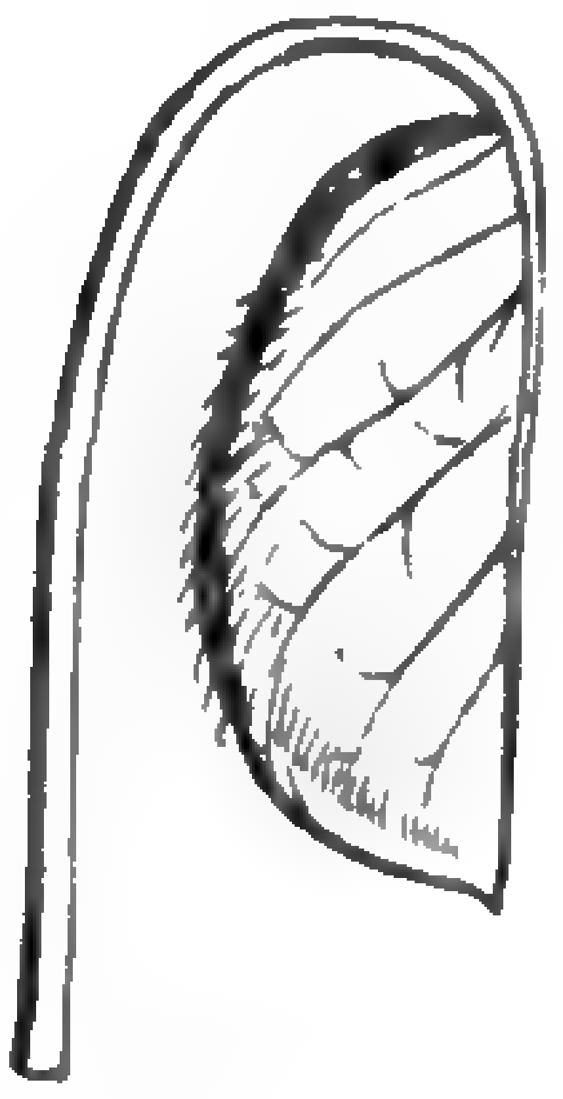


Fig. 12.

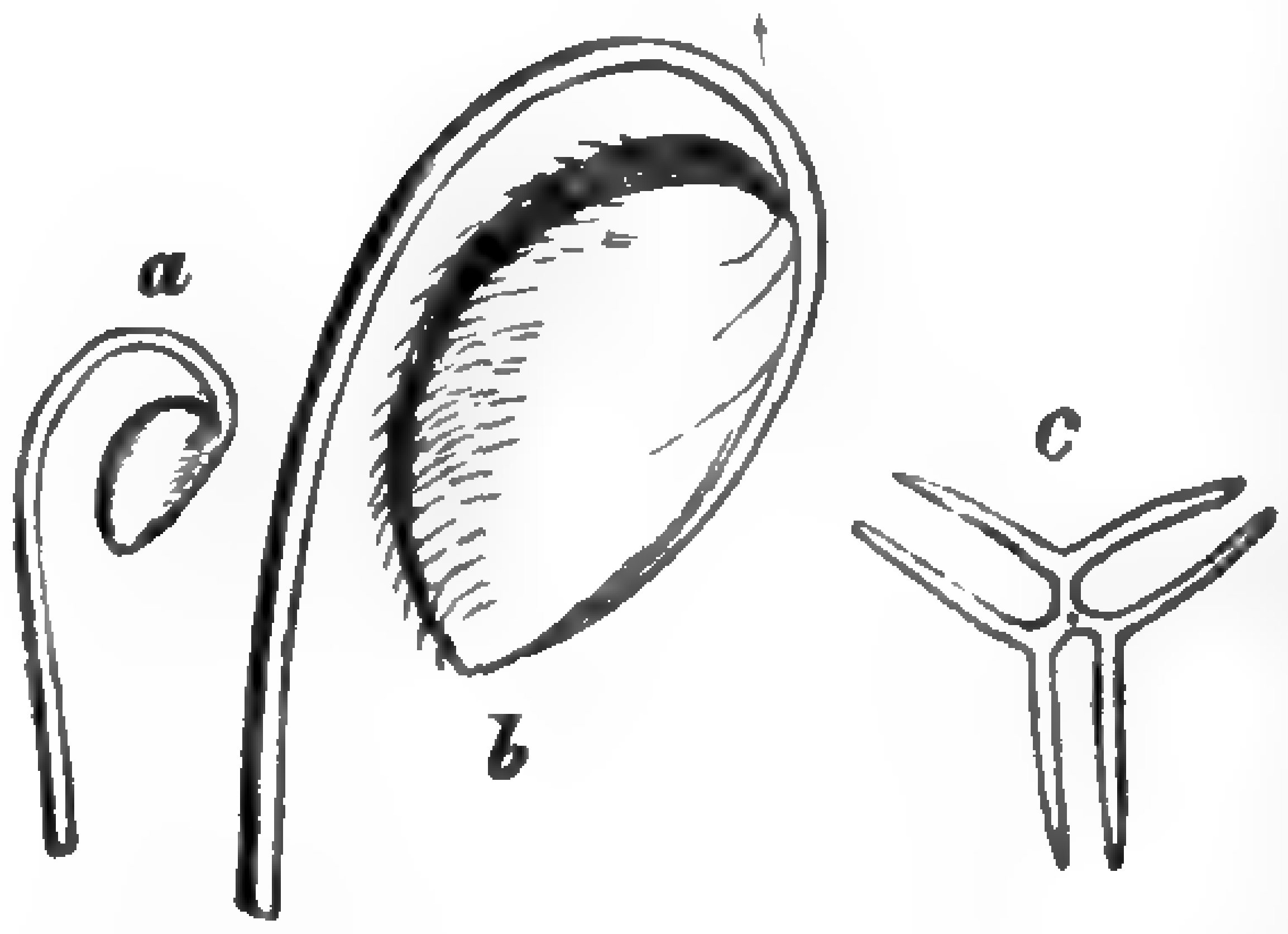


Fig. 10. Laburnum.

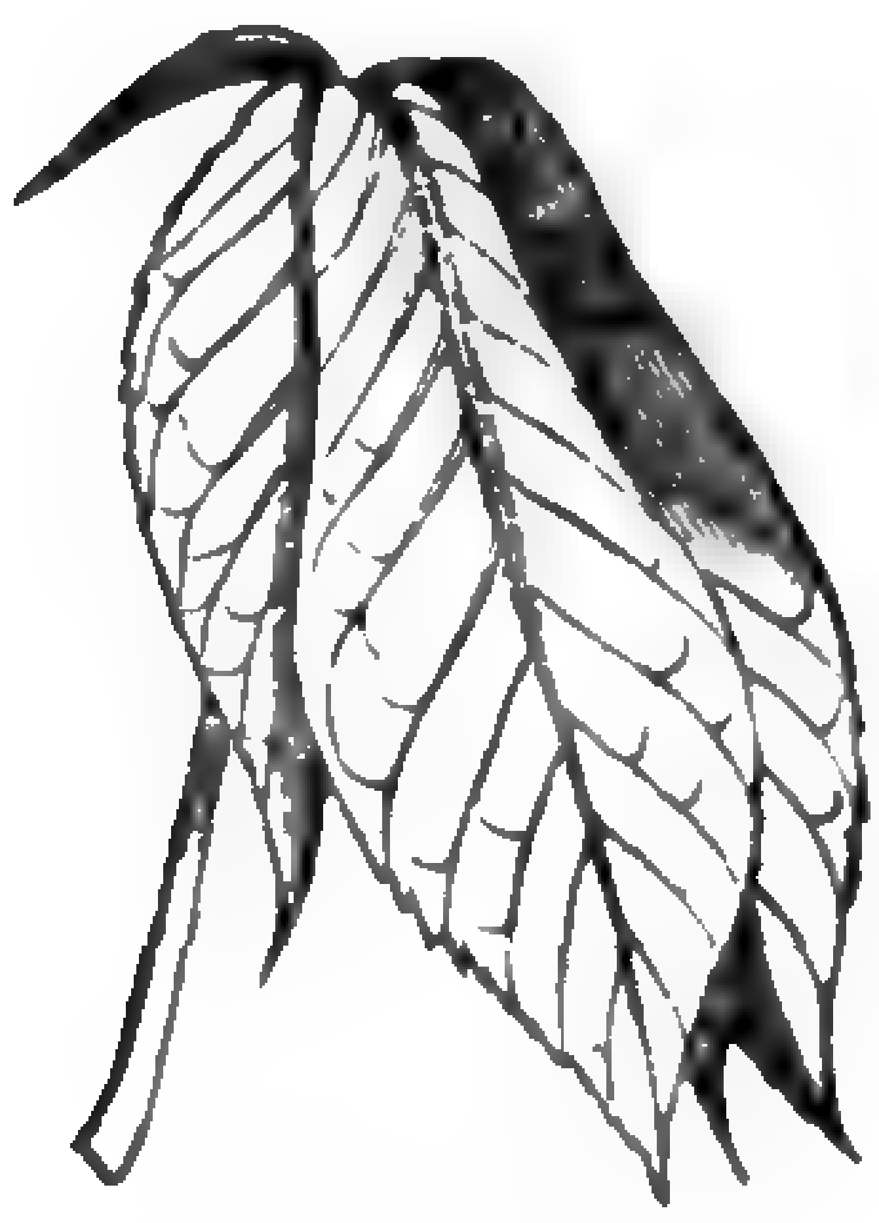
Fig. 11. Clover.

Fig. 12. Woodsorrel: *a*, nat. size; *b*, magnified; *c*, vertical aspect, in diagram as seen asleep.

This seems to indicate that the danger from exposure in the very young state being much greater than in the adult, the protection is correspondingly more perfect.

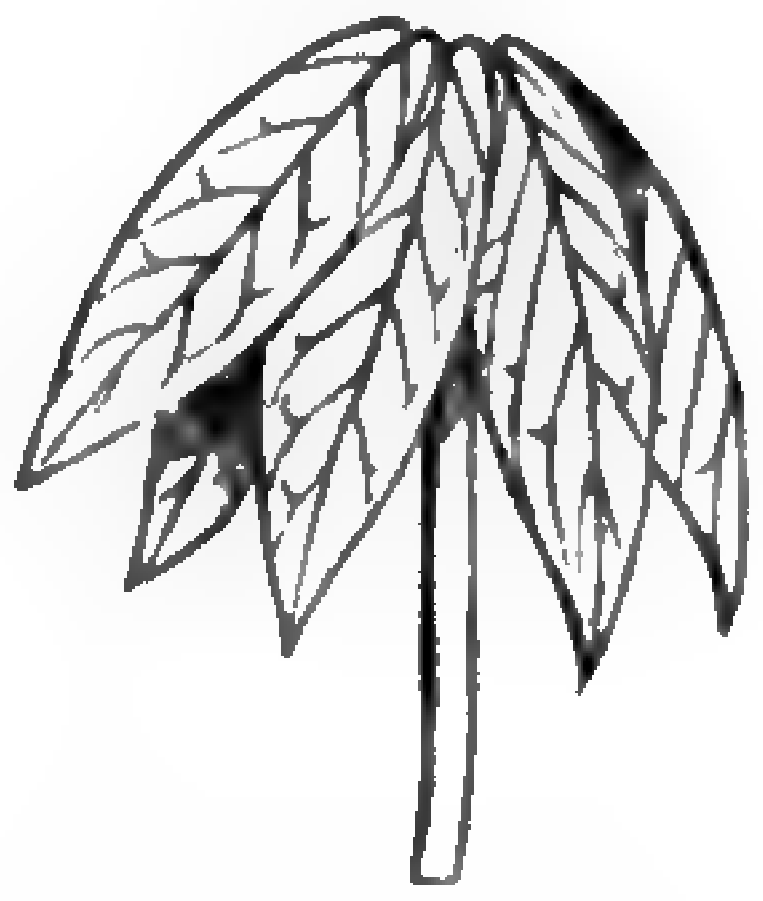
In the Horse Chestnut (fig. 13) the digitate leaf has at first all the leaflets dependent and more or less covering one another. This is exactly similar to the condition of the leaflets of *Lupinus pilosus* when asleep, as described by Mr. Darwin † (fig. 14). It

Fig. 13.



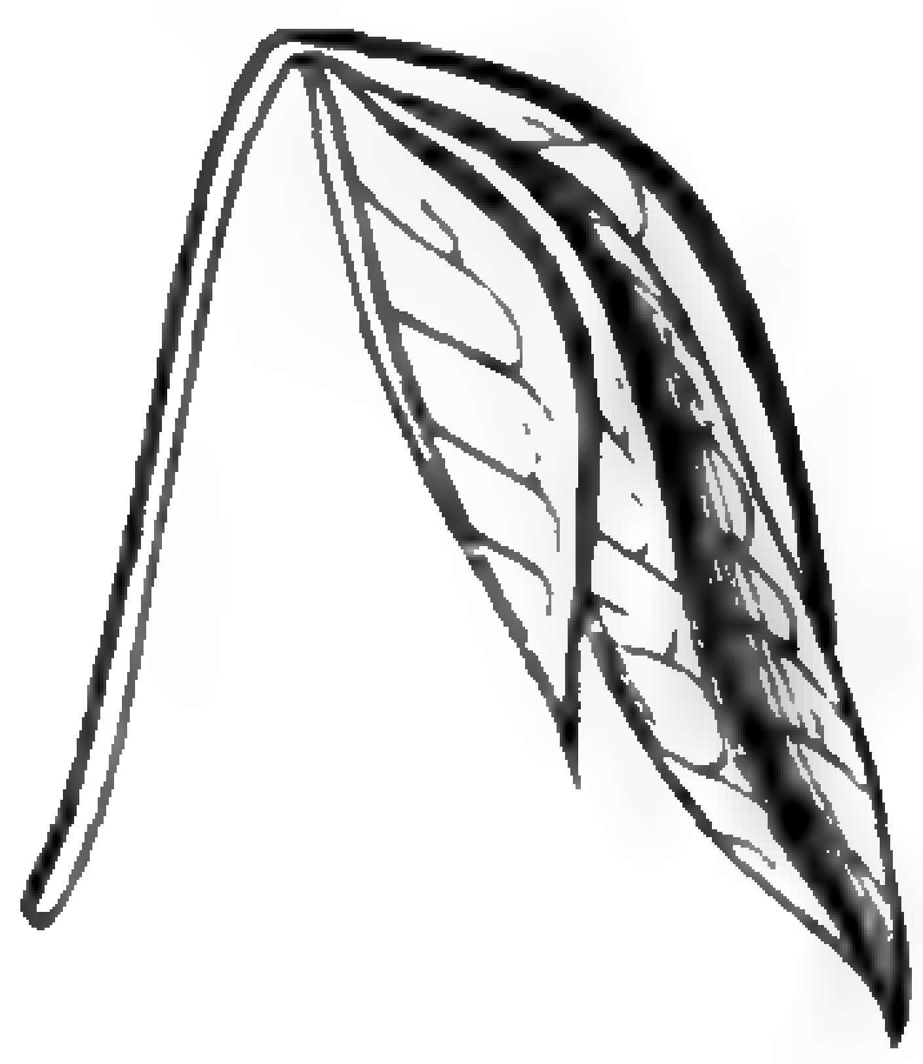
Horse Chestnut.

Fig. 14.



Lupinus pilosus. Leaf, seen laterally, asleep at night-time. After Darwin.

Fig. 15.



Walnut.

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* This is due to the fact, at least in Clover, that a thick layer of chlorophyllaceous tissue is developed over the fibro-vascular bundle of the midrib, thereby preventing the two halves closing again.

† *L. c.* p. 341, fig. 137.

may be added that the leaflets of Lupin are at first clustered together and conduplicate. The Virginian Creeper has its five leaflets at first conduplicate and suberect; they gradually curve over and spread themselves vertically like a star, not unlike the method adopted by *Lupinus pubescens*, as described by Mr. Darwin.

The petiole of the Walnut-leaf (fig. 15 *), on emerging from the bud (the scales of which, like those of the Ash, are petiolar), curves strongly downwards, so that the leaflets, which are conduplicate, stand in a vertical plane. As the basal ones expand they still remain with their surfaces vertical, and it is not until they are approaching maturity that the petiole rises up and the leaflets spread themselves out horizontally.

Besides vernation, conduplication, and the subsequent vertical position of leaves and leaflets, as calculated to protect them from the evil effects of radiation, hairs and tomentum &c. must not be forgotten as being bad conductors of heat, and therefore very important aids to protect the organs clothed with them. Foliar organs and axes, when young, are often very hairy, silky, or woolly, as the case may be, which in older states become more or less glabrous, either by the hairs becoming more sparsely scattered by epidermal growth, or by vanishing altogether. Similarly the stellate pubescence or woolly clothing, which is not an unfrequent character of the young condition, often disappears as soon as the surfaces thus protected are sufficiently advanced to require such additional aids no longer. As examples may be mentioned the young shoots of Poplar, Apple, Ivy, &c., while the leaves of Coltsfoot are at first densely villous, but soon lose the cottony webs from the upper surface as they become adult.

CONCLUSION.—The examples given in this paper could, of course, be multiplied indefinitely; but enough seems to have been stated to justify a belief in the general accuracy of the deduction that vernation, conduplication, the various positions taken up by developing leaves, &c., all conspire to protect them from the evil effects of radiation.

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* In the printing of p. 632 the woodcuts representing Walnut and Laburnum petiole respectively have accidentally been transposed.

Burmese Desmidieæ, with Descriptions of new Species occurring in the neighbourhood of Rangoon. By W. Joshua, F.L.S.

[Read 5th February, 1885.]

(Plates XXII.–XXV.)

During the winter of 1883–84 I received, through the kindness of Dr. Robert Romanis, F.L.S., of Rangoon, some collections of freshwater Algæ, taken from the leaves of *Pistia Stratiotes*. On preparing these for microscopic use, and on frequent subsequent examinations, they appeared to contain so many Desmidieæ entirely new to science that I thought a detailed enumeration would be necessary.

The best collection was made after the rainy season from a pond, or old tank, in the vicinity of Rangoon, situated on the glacis of the fort surrounding the Pagoda, to the right of the south approach. This tank is only of small dimensions, being not more than 30 ft. square and about 20 deep. It appears to be of considerable antiquity, having been placed there in Burmese times, and is said never to be disturbed by cleaning out, a condition conducive to the multiplication of these interesting forms. The surrounding soil is a friable sandstone in beds of shale, producing alum. The locality lies at the eastern estuary of the Irrawady, about 26 miles from the sea, and on elevated ground.

It may be observed that many of the species are considerably smaller than their northern prototypes; still some of the Cosmarieæ and Docidieæ are of extraordinary size and beauty.

I am not aware that any special list of Burman Desmids has hitherto been recorded, save a few odd species mentioned by Dr. G. Zeller, in Journ. Asiat. Soc. of Bengal, vol. xlii. (pt. ii. Nat. Hist. i., iv. 1873), the Desmid portion of the Algæ collected in Arracan and British Burma by Mr. S. Kurz (*l. c.*) being there stated to be in the hands of Mr. W. Archer of Dublin. The only lengthened account of Eastern Desmids that I am acquainted with, is that by Dr. G. C. Wallich*, from a district of Lower Bengal, situated about 120 miles north-west of Calcutta, 1855; and a few notes of species collected by Herr Grunow, of Berndorf., Vienna, from the island of Banka, Singapore, 1855.

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* Ann. & Mag. Nat. Hist. (3) v. pp. 184 and 273, pls. 7, 8, 13, and 14.

As might be expected, some of Wallich's and Grunow's species exist here, as also others of Tropical America; while some bear a striking resemblance to forms found by Dr. Schweinfurth in Central Africa, and described by Prof. Cohn in 'Desmidieæ Bongoenses,' one especially noticeable, *Cosmarium Euastron*, having the remarkable cuneiform-stellate markings seen in his *C. tholiforme*. *Cosmarium Pardalis*, *Closterium Isidis*, and *Pleurotænium nodulosum*, De Bary, f. *tenuior*, also closely resemble some of the Rangoon forms. *Docidium*, *Euastrum*, and *Micrasterias* are well represented, as may be expected in an exotic list. Of the 186 species and varieties, in 16 genera, collected by Dr. Romanis, 100 have their representatives in Europe; and of the 7 Docidieæ, 4 are new.

The drawings have been made by a vertical camera, and enlarged from 200 to 900 diam. The list, though a long one, is, I feel sure, only tentative; for if a further search be made in other parts of the empire, doubtless many more interesting novelties will yet be found.

DESMIDIEÆ, *Kütz.*

1. DESMIDIUM, *Ag.*

D. (APLOGONUM) BAILEYII, f. TETRAGONA, *Delponte.*

D. SCHWARTZII, *Ag.* Conjugated: zygospores.

D. CYLINDRICUM, *Grev.*

D. QUADRATUM, *Nordst.* Conjugated zygospores. (Pl. XXII. fig. 3.)

D. QUADRANGULATUM, *Ralfs.*

2. ONYCHONEMA.

O. LÆVE, *Nordst.* Conjugated: zygospores.

3. BAMBUSINA, *Kütz.*

B. BREBISSONII, *Kütz.*

4. SPHÆROZOSMA, *Corda.*

S. PULCHRUM, *Bailey*, *β.* TRILOBUM, n. var. (Plate XXII. figs. 1 & 2.)

S. cellulis triplo latis quam longis, breviter utrinque convexis forma irregularibus, a vertice conspectis 3-lobatis, lobis basi valde elongatis: isthmo nonnihil elongato. Longit. 28 μ, latit. 40 μ, crassit. 45 μ: isthmi latit. 10 μ.

Cells three times as wide as long, on each side slightly convex, connecting isthmus rather elongated. Cells rather irregular in shape, in end view three-lobed; base of lobes much elongated. Length 28 μ; width 40 μ; thickness 45 μ; width of isthmus 10 μ.

S. FILIFORME, *Ehrenb.*

SPHÆROZOSMA sp.? Probably new.

S. EXCAVATUM, *Ralfs.*

S. EXCAVATUM, β. WALLICHI, *Jacobs.*

5. GONATOZYGON, *De Bary.*

G. ASPERUM, *Bréb.*

6. MICRASTERIAS, *Ag.*

M. MAHABULESHWARENSIS, *Hobson.* Very fine; abundant.

M. TRUNCATA, *Corda*, v. CRENATA.

M. ROTATA, *Grev.*

M. PINNATIFIDA, *Kütz.*

M. TROPICA, *Nordst.*

M. APICULATA, *Menegh. n. f.* (Plate XXII. fig. 13.)

M. prominentiis centralibus in quavis semicellula spinis robustis circumdatis.

A variety with central protuberances in each semicell circled with strong spines.

M. CRUX-MELITENSIS (*Ehrenb.*), *Ralfs*, var.: see Delponte, pl. iv. 7, 12. (Plate XXII. figs. 10 & 11.)

M. ALATA, *Wallich* (*l. c.* p. 279, pl. xiii. fig. 11). Entirely identical with the Bengal species, and abundant.

M. INCISA, *Kütz.*, var β. *Wallich.*

M. FOLIACEA, *Bailey.*

M. LUX, n. sp. (Plate XXII. fig. 12.)

M. magna, orbicularis, lævis: semicellulis distincte 4-lobatis, lobis subdivisis, valde attenuatis, basi leviter inflatis, apicibus profunde furcatis, radios rectos sistentibus: lobis terminalibus anguste cuneatis, divergentibus, attenuatis. Longit. (sine brachio) 180 μ, latit. (cum spinis) 217 μ: isthmi latit. 25 μ: expansio lobi polaris 52 μ.

Large, orbicular, smooth; semicells distinctly 4-lobed; lobes subdivided; slightly inflated at base; much attenuated; deeply furcate at ends, forming straight rays; end-lobes narrow-cuneate, divergent, and attenuated. Differing from *M. radiosa*, Ralfs, by its larger size and linear form of subdivisions. Length, without arm, 180 μ; breadth, with sp., 217 μ; width of isthmus 25 μ; spread of polar lobes 52 μ.

M. CERATOFERA, *nob.*, *Journal of Botany*, vol. xxiii. p. 34, tab. 254. figs. 4*a*, 4*b*.

M. EUASTROIDES, n. sp. (Plate XXII. fig. 14.)

M. mediocris, subquadrata; semicellulis 5-lobatis, lobo terminali truncato, profunde constrictis, marginibus denticulatis superficie spinis brevibus ornatis. Longit. 103 μ, latit. 90 μ.

Medium; subquadrate; semicells 5-lobed, deeply constricted, denticulate at edges, and furnished with short spines on surface; end-lobe truncate; length 103 μ, breadth 90 μ. In appearance resembling some of the forms of *Euastrum verrucosum*; but probably a new *Micrasterias* allied to *M. mahabuleshwarensis*, Hobson, and *M. Wallichi*, Grun.

7. EUASTRUM, *Ehrenb.*

E. AUSALUM, *Ralfs.*

E. AUSALUM, var. AMPLIATUM.

E. SINUOSUM, *Lenorm.*

E. DIDELTA, *Ralfs.*

E. BINALE, *Ralfs*, n. f. CRASSUM. (Plate XXIII. figs. 11, 12, & 13.)

E. TURGIDUM, *Grun.*

E. SUBSTELLATUM, *Nordst.*

E. GEMMATUM, *Bréb.*, MONONCYCLUM, *Nordst.*

E. DECEDENS, *Reinsch.*

E. CUNEATUM, *Jenner.*

E. SPINULOSUM. *Delponte*, f. INERMIUS, *Nordst.*

E. OBLONGUM, *Grev.*, f. SCROBICULATUM, *Nordst.*

E. ELEGANS, *Bréb.*

E. SUBLOBATUM, *Bréb.*

E. HYPOCHONDRUM, *Nordst.*

E. RETRORSUM, n. sp. (Plate XXIII. figs. 14 & 15.)

E. mediocre, diametro plus quam duplo longius, prominentiis marginalibus instructum; semicellulis obscure 3-lobatis, angulis lateralibus productis, versus apicem recurvis, centro inflatione magna; cytiodermate crasso: isthmo vix attingente ¼ partem latitudinis: constrictione lineari. Longit. 75 μ, latit. apud punctum constrictionis 35 μ.

Medium size, rather more than twice as long as wide; semicells obscurely 3-lobed; lateral angles produced, and pointing backwards towards apex, with large central inflation; cytioderm thick; isthmus scarcely one fourth of width; constriction linear; cells ornate with marginal protuberances. Length 75 μ; breadth at point of constriction 35 μ.

E. OBESUM, n. sp. (Plate XXIII. figs. 19 & 20.)

E. parvum, nonnihil longius quam latum: semicellulis 3-lobatis, centro non inflatis; lobis globose rotundatis, lobo polari inciso, a latere conspectis ovatis, apicibus truncatis: membrano pallide carneo, aliquando indistincte granulato. Longit. 50–80 μ, latit. 30–35: isthmi latit. 9–15 μ.

Small, rather larger than broad; semicells 3-lobed; each lobe globularly rounded; polar lobe with incision; side view oval, with truncated ends; no central inflation of semicells; membrane a faint flesh-colour, sometimes indistinctly granulated. Length 50–80 μ; breadth 35–30 μ; width of isthmus 9:15 μ.

E. FLAMMEUM, n. sp. (Plate XXIII. figs. 3, 4, & 5.)

E. mediocre, nonnihil longius quam latum: semicellulis 4-lobatis, profunde constrictis, prominentia magna prope basin cujusve lateris, lobis terminalibus truncatis, dilatatis, spinum robustum magnum apud angulos singulos ferentibus; sinu apicali profundo, magno, versus centrum nonnihil latiore, lobis lateralibus tres spinos magnos rectangulares ostendentibus. Longit. (sine spinis) 48 μ, latit. (sine spinis) 28 μ: constrictionis latit. 7 μ: sinus polaris longit. 12 μ, basi latit. 4 μ.

Medium size, rather longer than broad; semicells 4-lobed; constriction deep, a large protuberance on each side near base; end-lobes truncate, dilated, bearing at each angle a large stout spine; the apical notch deep and large, somewhat widened towards the centre, with three large rectangular spines at each side of lateral lobes. Length 48 μ, without spines; width, without

spines, 28 μ; width of constriction 7 μ; length of polar notch 12 μ, and width at base 4 μ.

E. CORALLOIDES, n. sp. (Plate XXIII. fig. 10.)

E. parvum nonnihil longius quam latum: semicellulis 4-lobatis, anguste constrictis, prominentiis quatuor truncatis in quavis semicellula; angulis latis hirsutis, truncato-elongatis: membrano pallide roseo. Longit. 40 μ, latit. 30 μ: isthmi latit. 13 μ.

Small, rather longer than broad; semicells 4-lobed; constriction narrow, with wide angle; four truncate protuberances in each semicell; angles rough and truncate-elongate, giving the whole plant a rough and coral-like appearance; membrane pale pink. Length 40 μ; breadth 30 μ; width of isthmus 13 μ.

E. TRUNCATUM, n. sp. (Plate XXIII. figs. 6 & 7.)

E. mediocre, subquadrangulare, fere duplo longius quam latum: semicellulis 3-lobatis, marginibus lævibus crenatis, lobis lineari-divisis, basi globose inflatis, lobo polari attenuato, leviter depresso: prominentiis centralibus magnis, duabus in quavis semicellula: isthmo lato, sinu lineari stricto. Longit 65 μ, latit. ad basin 37 μ: lobi polaris latit. 24 μ: isthmi latit. 16 μ.

Medium size, subquadrangular, about twice as long as broad; semicells 3-lobed, with smooth crenate edges; polar lobe attenuate, with slight depression; central protuberances large, two in each semicell; isthmus wide, with close linear notch; divisions of lobes linear; basal portion a circular inflation. Length 65 μ; breadth at base 37 μ; breadth of polar lobe 24 μ; width of isthmus 16 μ.

E. ATTENUATUM, *Wolle.*

E. SERRATUM, n. sp. (Plate XXIII. figs. 1 & 2.)

E. vix duplo longius quam latum, profunde constrictum; semicellulis 6-lobatis, prominentiis duabus magnis in quavis cellula, late a puncto divisionis remotis, lobis lineari-divisis, ad basin globosis, angulis acutis, interne conspectis distincte serratis, lobis terminalibus incisis, angulis exterioribus divergentibus, attenuatis. Longit. 58 μ, latit. 35 μ: isthmi latit. 8 μ.

Scarcely twice as long as broad; constriction deep; semicells 6-lobed; angles sharp, having on inside view a decided serrate appearance, with two large protuberances in each semicell, widely removed from point of division; isthmus nearly quarter of width; end-lobes incised, with exterior angles divergent and attenuated;

divisions of lobes linear, circular at base. Length 58 μ, width 35 μ; width of isthmus 8 μ.

E. exile, n. sp. (Plate XXIII. figs. 16, 17, & 18.)

E. parvum, quadratum, diametro plus duplo longius: semicellulis 1-lobatis, constrictionibus tribus lateralibus, et prominentia unica conica, a vertice conspectis ovatis: apicibus truncatis; angulis polaribus spinis longis robustioribus projectis: isthmo divisione lineari. Longit. (sine spinis) 30 μ, latit. ad punctum divisionis 13 μ: isthmo vix $\frac{1}{3}$ latitudinis.

Small, quadrate, rather more than twice as long as broad; semicells 1-lobed, having three lateral constrictions and one conical protuberance; apex truncate; polar angles with long, rather stout spinous projections; end view ovate; isthmus scarcely one third of width; division linear. Length without spines 30 μ; width at point of division 13 μ.

E. divergens, n. sp. (Plate XXIII. figs. 8 & 9.)

E. fere tam longum quam latum, centro profunde constrictum, angulo lineari valde dilatato: semicellulis profunde 3-lobatis, granulis magnis, supra centri inflationem concentrice dispositis; lobis lateralibus semifusiformibus, apicibus truncatis, parte superiori granulis margaritaceis paulum elongatis, seriebus verticalibus dispositis, minute ornatis; lobo polari quadrato, truncato (latitudine æquanti tertiam partem diametri transversi cellulæ). Longit. 48 μ, latit. 48 μ: lobi polaris latit. 15 μ: isthmi latit. 10 μ.

About as long as wide, in the middle deeply constricted; linear angle much widened; semicells deeply 3-lobed; granules large above central inflation, in concentric arrangement; lateral lobes semifusiform; ends truncate; the upper part of lobes minutely ornate with pearly granules a little elongated, placed in vertical rows; polar lobe quadrate, end truncate. Somewhat similar at first sight to *E. breviceps*, Nord., and *E. bellum*, Nord., also *E. platycerum*, Reinsch; but differing in shape of basal lobes. Length = breadth 48 μ; width of polar lobe 15 μ; breadth of isthmus 10 μ.

E. orbiculare, *Wallich* (*l. c.* p. 282, plate xiv. figs. 8–11).

8. Staurastrum, *Meyen*.

S. bifidum, *Ralfs*, var. (Plate XXIV. figs. 8 & 9.)

S. proboscideum, *Bréb.*, f. javanica, *Nordst.*

S. margaritaceum, *Ehrenb.*, var. hirtum, *Nordst.*

S. LEPTOCLADUM, *Nordst.*, var. β. CRISTATUM, *Wolle.*

S. GRACILE, *Ralfs.* Several forms.

S. GRACILE, β. CURTUM, *Nordst.*

S. VESTITUM, *Ralfs.*

S. AVICULA, *Bréb.*

S. BRASILIENSE, *Nordst.*

S. LEPTOCLADUM, *Nordst.* (9-gona.)

S. SALTANS, n. sp. (Plate XXIII. fig. 21.)

S. majus; semicellulis quadrangularibus dorso late curvatis, lateribus apicis spino maguo expanso utrinque instructis, basi truncatis, profunde incisis, apud marginem granulis globosis minutis instructis: angulis superioribus brachii valde incurvis, apicibus bifurcatis; spinis valde robustis, superiori duplo et ultra majore; brachio granulis rotundatis serie regulari dispositis, instructo. Longit. 45 μ, latit. 93 μ, cum spina 150 μ.

Rather large; semicells quadrangular; the back widely curved, furnished at each side of apex with a large spreading spine; base truncate, with deep incision, furnished at edge with small globular granules; upper angles of arm much incurved, and with bifurcate apices; spines very strong, that on the upper side more than double the length of the other; arm having a regular series of circular granules. It differs from *S. leptocladum*, Nordst., in the absence of the lateral crenation and subglobose inflation of basal lobe. Length 45 μ; width to end of spine 93 μ, with spine 150 μ.

S. HORRESCENS, n. sp. (Plate XXIV. fig. 3.)

S. magnum, fere tam longum quam latum, subovatum, profunde constrictum, isthmo latitudine, spinis exclusis, æquanti $\frac{1}{5}$ partem diametris transversi: membrano toto spinis robustis, truncatis, in serie regulari dispositis, obtecto. Longit. sine spinis 73 μ, cum spinis 85 μ, latit. sine spinis 70 μ, cum spinis 80 μ: isthmi latit. 14 μ.

Large, about as long as broad, subovate, deeply constricted; breadth of isthmus one fifth part of transverse diameter, exclusive of spines; the whole membrane covered in regular disposition with strong truncated spines. Differing from *S. Pringsheimii*, Reinsch, the semicell of which forms nearly a perfect ellipse, and has no inflation of angle at point of juncture. Length without spines 73 μ, with spines 85 μ; width without spines 70 μ, with spines 80 μ; width of isthmus 14 μ.

S. SEXANGULARE, *Bulnh.*, n. var. (Plate XXIII. fig. 24.)

S. BIFURCUM, n. sp. (Plate XXIII. figs. 25–28.)

S. parvum, forma variabili, brachiis duobus aut tribus instructum; cytiodermate granulato, marginibus serratis: semicellulis a fronte conspectis cuneatis; basi lata; ad latera singula lobi apicalis spino majore instructis; lobo basali inflatione subglobosa. Longit. 23–48 μ, latit. 35–73 μ.

Small, variable in outline, sometimes with two, sometimes three arms; cytioderm granulate, margins serrate; semicells in front view cuneate, with broad base, furnished at each side of apical lobe with a larger spine; basal lobe with subglobose inflation. Its nearest relation is with *S. incisum*, Wolle. Length 23–48 μ; breadth 35–73 μ.

S. CUSPIDATUM, β. DIVERGENS, *Nordst.*

S. LONGISPINUM, *Arch.*

S. CYATHODES, n. sp. (Plate XXIII. figs. 22 & 23.)

S. mediocre: semicellulis cyathiformibus, triangularibus, brachiis longe productis, profunde fissis et trifurcatis, medio profunde constrictis, puncto junctionis minuto, a vertice conspectis, brachiis minute granulatis, granulis seriebus tribus dispositis: membrano haud omnino lævi. Longit. sine spinis 30 μ, latit. sine brachiis 22 μ: longit. ab apicibus 64–74 μ, latit. ab apicibus 47–50 μ: ? connexionis isthmi latit. 3 μ.

Medium size: semicells cyathiform, triangular, with long produced arms, deeply cleft and trifurcate; deeply constricted at middle, point of juncture very small; in end view with minute granulations on arms arranged in three rows; membrane not perfectly smooth. Length without spines 30 μ; breadth without arms 22 μ; length from apices 64 μ, 74 μ; breadth from apices 47 μ, 50 μ; width of connection 3 μ.

S. BACILLARE, *Bréb.*

S. DEJECTUM, *Bréb.*, β. CONNATUM, *Lund.*

S. INCONSPICUUM, *Nordst.*

S. PUNCTULATUM, *Bréb.*

S. CYRTOCERUM, *Bréb.*

S. DILATATUM, *Ehrenb.*

S. STRIOLATUM, *Naeg.*

S. TELIFERUM, *Ralfs.*

S FURCULOSTELLATUM, *Reinsch.*

S. GRANULATUM, *Reinsch.* (Plate XXIV. figs. 4 & 5.)

S. ORBICULARE, *Ralfs.*

S. POLYMORPHUM, *Bréb.*

S. FURCATUM, *Ehrb.*, *Bréb.*, β. SENARIUM, *Ehrenb.*, *Nordst.* (Plate XXIV. figs. 6 & 7.)

S. LEPTACANTHA, f. 9-gona, *Nordst.*

S. LEPTODERMUM, *Lundell.*

S. MINUSCULUM.

S. PLATYCERUM, n. sp. (Plate XXIV. figs. 1 & 2.)

S. cytiodermate lævi, pellucido: cellulis a fronte conspectis ovatis, brachiis triplo longioribus quam latit. corporis ipsius; apicibus divergentibus, tricuspidatis, marginibus hirsutis, prominentiis spinosis regulariter dispositis; radiis 4, 5, raro 6. Cellulæ latit. ad basin 18 μ, brachii longit. cum spinis 33–50 μ: expansio brachiorum 83–160 μ.

Cytioderm smooth and transparent; cells in front view ovate; arms 3 times as long as breadth of body; diverging apices tricuspidate; margins rough with regularly placed spinous protuberances; rays four, five, rarely six. It comes nearest *S. aspinosum*, Wolle, but has not the slender rectangular spines, and is a larger species. Width of cell at base 18 μ; length of arm, including spines, 33 μ, 50 μ; spread of arms 83 μ, 160 μ.

9. XANTHIDIUM, *Ehrenb.*

X. ARMATUM, *Bréb.*

X. ACANTHOPHORUM, *Nordst.*

X. ANTILOPEUM, *Kütz.*

X. ANTILOPEUM, f. JAVANICA, *Nordst.*

X. ANTILOPEUM, β. TRIQUETRUM, *Lund*, f. BRASILIENSE, *Nordst.*

X. ANTILOPEUM, f. ANGULATUM, n. var. (Plate XXIV. fig. 16.)

X. a fronte conspectum quadrangulare, minute punctatum, apicibus convexis; cellulis plus duplo latis quam longis, profunde constrictis, angulo lineari, nec inflatis nec granulatis; apicibus? angularibus, apud punctos singulos spinam longam subulatam ferentibus. Latit. sine spinis 48 μ, cum spinis 98 μ: isthmi latit. 10 μ.

In front view quadrangular, with convex ends, minutely punctate; cells rather more than twice as wide as long, with deep constriction, angle linear; no inflation or granulation; apices angular, bearing a long subulate spine at each point. Breadth without spines 48 μ; breadth with spines 98 μ; width of isthmus 10 μ.

10. ARTHRODESMUS, *Ehrenb.*

A. GIBBERULUS.

A. INCUS, *Hass.* Forms. (Plate XXIV. figs. 10, 11, & 12.)

A. OCTOCORNIS, *Ehrenb.*

A. SUBULATUS, *Nordst.*, n. var. GRACILIS. (Plate XXIV. fig. 13.)

A. mediocris, profunde constrictus, angulo lineari; semicellulis utriusque anguli polaris spinis longis convergentibus ornatis, nonnihil longioribus quam latis, apicibus spinarum fere conniventibus: dorso leviter curvato, cum spinis uniformiter arcuato. Longit. 27 μ, latit. sine spinis 35 μ, cum spinis 65 μ: constrictio 6–7 μ.

Medium size; deeply constricted, with linear angle; semicells at each polar angle furnished with long converging spines; the two apices of opposite spines nearly meeting; rather longer than wide; back slightly bent, forming a uniform curve with the spines. Length 27 μ; breadth without spines 35 μ, with spines 65 μ; constriction 6·7 μ.

A. ARCUATUS, n. sp. (Plate XXIV. fig. 14.)

A. mediocris, profunde constrictus, angulo late hianti, non spinosus, fere tam longus quam latus: membrano lævi aut leviter punctato: cellulis subovatis, dorso late rotundato: angulo utriusque poli spinoso, spina valida, divergenti. Longit. 40 μ, latit. sine spina 36 μ, cum spina 70 μ: constrictio 10 μ.

Medium size; deeply constricted, with wide gaping angle; without spines; about as long as broad; membrane smooth or slightly punctate; cells subovate; back widely rounded, with a strong divergent spine at each polar angle. Length 40 μ; breadth without spine 36 μ, with spine 70 μ; constriction 10 μ.

A. APICULATUS, n. sp. (Plate XXIV. fig. 15.)

A. parvus, subtrapezoideus: profunde constrictus, angulo latiore: semicellulis lateribus rotundatis, dorso curvato, inflato: angulis polaribus spinis apiculatis verticalibus ornatis.

Small, subtrapezoidal, rather longer than wide; semicells with rounded sides and curved inflated back; polar angles furnished with apiculate spines, set vertically; constriction deep, with rather wide angle. Not common. No measurements made.

11. COSMARIUM, *Corda*.

C. EUASTRON, n. sp. (Plate XXIV. figs. 30–34.)

C. mediocre, ovatum, $1\frac{1}{4}$–$1\frac{1}{2}$-plo longius quam latum, apicibus non truncatis, profunde constrictum: strictura lineari aut anguste cuneata: semicellulis semirotundatis: angulis inferioribus fere rectis, apicibus ovatis: membrano crasso, dilute pallido-flavescente (colore intensiore in centro zonali cellulæ), papillis magnis, basi expansis, stellato-dispositis. Longit. 65–95 μ, latit. 47–50 μ: crassit. 27–33 μ: isthmi latit. 15 μ.

Medium size, oval, $1\frac{1}{4}$ to $1\frac{1}{2}$ times longer than wide; ends not truncate, deeply constricted; stricture linear, or narrow wedge-shaped; semicells semicircular; lower angles nearly straight; apices oval; membrane thick, very pale yellow, deepening in zonal centre of cell; papillæ large, with spreading base, and showing a clearly defined quincunx arrangement with stellato-cuneiform rays in oblique light. Smaller and more globose than *C. tholiforme*, Cohn, to which it comes nearest. Length 65 μ–90 μ; breadth 47–50 μ; thickness 27–33 μ; width of isthmus 15 μ.

C. TURGIDUM, *Bréb.*

C. GRANATUM, *Bréb.*

C. DEBARYII, *Arch.*

C. PULCHERRIMUM, *Nordst.* A small var.

C. CUCURBITA, *Bréb.*

C. CRENATUM, *Ralfs.*

C. CAPAX, n. sp. (Plate XXV. fig. 8.)

C. magnum, cylindricum, duplo longum quam latum, medio vix constrictum, annulo marginali ad punctum junctionis: lamellis chlorophyllaceis multis, curvatis, granulis amylaceis passim dispersis: membrano pallide fusco, regulariter minute punctato. Longit. 165 μ, latit. 90 μ.

Large, cylindrical, twice as long as wide; middle scarcely constricted, with a marginal ring at point of juncture. The chlorophyll-plates of contents many and curved, with starch-granules scattered throughout; membrane pale brown, regularly and minutely punctate. Length 165 μ; width 90 μ.

C. OBSOLETUM, *Hantzsch.*

C. SMOLANDICUM, *Lund.*

C. CUCUMIS, *Corda.*

C. BOTRYTIS, *Menegh.*, var. INDICUM, n. var. (Plate XXIV. fig. 19.)

C. semicellulis profunde constrictis, centro non inflatis, granulis delicatis regulariter et symmetrice dispositis, spatio lucido ovato ad centrum cujusve cellulæ: isthmo latitudine inter $\frac{1}{4}$ et $\frac{1}{5}$ partem diametris transversi. Longit. 88 μ, latit. 65 μ: isthmi latit. 16 μ.

Semicells with fine granules regularly and symmetrically arranged, with a clear oval space in centre of each cell 20 μ by 13 μ; without central inflation, deeply constricted (width of isthmus between the fourth and fifth part of transverse diameter). Differing from *C. Botrytis*, *β. mesoleium*, Nordst., in the narrow isthmus and arrangement of granules. Length 88 μ; breadth 65 μ; width of isthmus 16 μ.

C. TETRAOPHTHALMUM, *Kütz.*

C. AMŒNUM, *Bréb.*

C. MENEGHINII, *Bréb.*, and forms.

C. PYRAMIDATUM, *Bréb.* A variety with slight inflation in semicell.

C. LATUM, *Bréb.*

C. PALANGULA, *Bréb.*

C. CONSPERSUM, *Ralfs.*

C. DIADEMA, n. sp. (Plate XXV. fig. 7.)

C. magnum, fere $1\frac{1}{2}$-plo longius quam latum, cylindricum: semicellulis leviter constrictis, late marginatis, granulis magnis in seriebus equidistantibus dispositis, intersticibus minute punctatis. Longit. 75 μ, latit. 50 μ.

Large, nearly $1\frac{1}{2}$ times longer than wide, cylindrical; semicells slightly constricted, with wide marginal band; granules large, symmetrically placed in equidistant rows, minutely punctate in interstices. Length 75 μ; breadth 50 μ.

C. RECTANGULARE, *Grun.*

C. GLOBOSUM, *Bulnh.*

C. NORIMBERGENSE, *Reinsch.*

C. ARMATUM, n. sp. (Plate XXIV. figs. 21–25.)

C. parvum, subhexagonale, nonnihil longius quam latum, constrictione lineari, recta: semicellulis trapezoideis, basi latis, apice truncatis, prominentiis obtusis 7–13, in serie interiore dispositis (ad basin poli multo majoribus); marginibus prominentiis validis conicis, 4–5 utroque latere fimbriatis, dorso nudo: cellulis multum inflatis, a latere conspectis sphæricis. Longit. 35 μ, latit. 25 μ: isthmi lat. $8\frac{1}{2}$ μ.

Small, subhexagonal, rather longer than wide; median division a straight line; half-cells trapezoidal, with wide base furnished with an inner row of blunt protuberances 7–13, much enlarged at base of polar end; end truncate, fringed at margin with strong conical projections 4–5 in each side, none on the back; cells considerably inflated, appearing spherical in side view. This species has some resemblance, especially fig. 4 *c* and 4 *d*, with *C. vosgesiacum*, Lemaire; it stands also near *C. Reinschii*, Arch. Length 35 μ; breadth 25 μ; width of isthmus $8\frac{1}{2}$ μ.

C. PUNCTULATUM, *Bréb.*

C. CUNEATUM, n. sp. (Plate XXIV. figs. 17 & 18.)

C. mediocre, constrictione profunda: cellulis ovato-cuneatis, fere tam longis quam latis; semicellulis acute cuneatis, dorso nudo, centro granulis 4 utroque latere dorsi, nec ad apices provectis, marginibus extremis granulis 14–17 majoribus, rotundatis, seriatim dispositis ornatis; angulis lateralibus a latere conspectis, semiacutis: isthmo latitudine circa $\frac{1}{4}$ partem diametris transversi. Longit. 46 μ, latit. 46 μ: isthmi latit. 11 μ.

Medium size; cell ovato-cuneate, about as broad as long; semicells sharply cuneate, with broad back, furnished at extreme edge with a series of 14–17 large circular granules, diminishing in size on each side as they approach the linear median line, and in many specimens showing a double row of granules above the centre; there is also a central series of granules, 4 on each side of back, not carried to the apex; seen in side view, lateral angles semiacute; constriction deep. It stands nearest to *C. monomazum*, Nordst. Breadth=length 46 μ; breadth of isthmus 11 μ.

C. SPINOSUM, n. sp. (Plate XXV. figs. 3 & 4.)

C. mediocre, paulo longius quam latum, semiellipsoideum; membrano interiore minute et regulariter punctato, serie unica aut duplici punctorum majorum nonnihil procul a constrictione addita; semicellulis seriem spinarum circa 6 utroque latere (non ad apicem provectarum) ferentibus: cellulis a latere conspectis globosis: isthmo latitudine fere $\frac{1}{2}$ diametri transversi: angulo sinu lato apud punctum junctionis. Longit. 51 μ, latit. (sine spinis) 40 μ.

Medium size; rather longer than broad, semielliptical; inner membrane minutely and regularly punctate, with a single or double row of rather larger punctations, encircling at some distance the constriction; furnished with a row of spines about 6 on each side of semicell, which are not extended to apex; seen in side view, they form two divergent rays, approaching nearer at base and widening upwards; in side view, cells globose (width of isthmus about half the transverse diameter); angle at point of juncture forming a wide notch. Length 51 μ; breadth without spines 40 μ.

C. SUBTUMIDUM, *Nordst.*, β. PLATYDESMIUM, *Nordst.*

C. INCISUM, n. sp. (Plate XXIV. figs. 28 & 29.)

C. mediocre: cellulis plus 1½-plo longis quam latis: constrictione angustata, lineari: semicellulis subquadratis; basi recta: angulis apicalibus rotundatis, apice truncato, late depresso; membrano interiore minute granulato: isthmo angusto. Longit. 38 μ, latit. 26 μ, crassit. 19 μ: isthmi latit. 18 μ.

Medium size; cells rather more than 1½ times as long as wide; constriction narrow, linear; semicells subquadrate; base straight; apical angles rounded; apex truncate, with wide depression; inner membrane minutely granulate; isthmus narrow. Nearest some of the forms of *C. Meneghinii*, Bréb. Length 38 μ; breadth 26 μ; thickness 19 μ; width of isthmus 18 μ.

C. ANNULATUM, *Naeg.*, f. Except in shape of granules, identical with *C. elegantissimum*, Lundell.

C. PACHYDERMUM, *Lund.*

C. PACHYDERMUM, β. MINUS, *Nordst.*

C. GEMINATUM, *Lund.*

C. BAILEYII, *Wolle.*

C. PORTIANUM, *Arch.*

C. PYGMÆUM, *Arch.*

C. TETRAGONUM, *Naeg.*, *Arch.*

C. CONTRACTUM, *Kirschner.*

C. SUBROTUNDUM, *Delponte.*

C. BICARDIA, *Reinsch.*

C. UNDULATUM, *Corda*, γ. MINUTUM, *Wittr.*, var. ORNATUM, *Schaær.*

C. DEPRESSUM, *Naeg.*

C. QUADRATUM, *Ralfs*, f.

C. PARDALIS, *Cohn*, f. MINOR, n. var. (Plate XXIV. fig. 20.)

C. INORNATUM, n. sp. (Plate XXIV. figs. 26 & 27.)

C. mediocre, nonnihil duplo longius quam latum, fere cylindricum, apice leviter truncato: lateribus late rotundatis; centro leviter constricto; angulo latiore: semicellulis a latere conspectis ellipsoideis; membrano crenato; verrucis indistinctis, nullis in centro, sæpe in serie externa modo visis. Longit. 44 μ, latit. 18 μ: isthmi latit. 15 μ.

Medium size; rather more than twice as long as wide; nearly cylindrical; apex slightly truncate; widely rounded at sides, in middle slightly constricted, with rather wide angle; side view of semicells elliptical; membrane crenate; verrucæ very faintly visible, absent in centre of cells, the outer row only often the only ones visible. Length 44 μ; breadth 18 μ; width of isthmus 15 μ.

C. EXASPERATUM, n. sp. (Plate XXV. figs. 1 & 2.)

C. parvum, fere tam longum quam latum: cellulis anguste ellipsoideis, profunde constrictis, angulo late hiante, prominentiis validis, truncatis, irregularibus obtectis, in seriebus 2–3 horizontalibus in utraque semicellula dispositis: a vertice conspectis angustis, ellipsoideis; cytiodermate crasso. Longit. cum prominentiis 40 μ, sine prominentiis 35 μ: latit. cum prominentiis 42 μ, sine prominentiis 38 μ: isthmi latit. 11 μ: crassit. sine prom. 16 μ, cum prom. 23 μ.

Small; about as long as wide; cells narrowly elliptical, covered with rows of strong, truncated, rather irregular protuberances, arranged in 2 or 3 horizontal rows in each semicell; deeply constricted, with wide gaping angle; end view narrow, elliptical; cytioderm thick. Length with protuberances 40 μ, without protuberances 35 μ; breadth with protuberances 42 μ, without protuberances 38 μ; width of isthmus 11 μ; thickness without protuberances 16 μ, with protuberances 23 μ.

C. BIFARIUM, n. sp. (Plate XXV. figs. 5 & 6.)

C. parvum, paulo longius quam latum; profunde constrictum, angulo anguste lineari, semicellulis subovatis; angulis rotundatis, minute regulariter granulatis, prominentiis 5–6 magnis sphæricis in seriebus duabus horizontalibus dispositis; a vertice conspectis subsphæricis, utroque latere polari prominentiam rotundatam, elongatam ferentibus. Crassit. sine papillis 15 μ, longit. 25 μ, latit. 23 μ: isthmi latit. 6 μ.

Small; rather longer than wide; deeply constricted, with narrow linear angle; semicells subovate; angles rounded, minutely and regularly granulate, with 5 or 6 large spherical protuberances in two horizontal rows; end view subspherical, showing on each side of polar end a rounded elongate protuberance.

Thickness without papillæ 15 μ; length 25 μ; breadth 23 μ; breadth of isthmus 6 μ.

C. Hammeri, *Reinsch.*

C. retusum, *Perty.*

C. venustum, *Bréb.*

12. Pleurotænium, *Naeg.*

P. nodosum, *Bailey.*

P. clavatum, *Kütz.*

P. indicum, *Grun.*

P. indicum, f. minor.

13. Docidium, *Bréb.*

D. Baculum, *Bréb.*

D. granuliferum, n. sp. (Plate XXV. figs. 11 & 12.)

D. magnum, diametro 14–15-plo longius, ad basin semicellulæ nflatione subhemisphærica indistincte undulatum, apicibus truncatis angustioribus: membrano crasso, granulis magnis regulariter obtecto, granulis singulis fere sphæricis, centro nodulosis: zygosporis ignotis. Longit. 680–885 μ, latit. apud apicem 35–40 μ: inflationis latit. 45–60 μ: latit. in centro semicellulæ 45–60 μ: granulationes 3 in 1 μ.

Large; 14–15 times longer than wide, with a subhemispherical inflation at base of semicell; indistinctly undulated; apices truncate, rather narrowed; membrane thick, regularly covered with large granulations; each granule nearly spherical, having a central nodule; zygospore unknown. In size and shape resembling *Pleurotænium maximum*, Reinsch. Length 680 μ–885 μ; width at apex 35 μ–40 μ; width of inflation 45 μ–60 μ; width in middle of semicell 45 μ–60 μ; granulations 3 in 1 μ.

D. tessellatum, n. sp. (Plate XXV. fig. 15.)

D. mediocre, diametro 8–9-plo longius, a medio ad apicem, vix angustatum, præter apices, projectionibus magnis irregularibus quadratis, sursum deminutis, obtectum: membrano non punctato: apice leviter angustato, spinis 8–9 truncatis exsertis instructo. Longit. 200–330 μ, latit. 25–35 μ: apicis latit. 16–24 μ.

Medium size; 8–9 times longer than broad from middle to apex, scarcely narrowed, covered with large irregular quadrate projections not extending to apex, but diminishing in size upwards; membrane not punctate; apex slightly narrowed, furnished with 8 or 9 truncate spines set outward. It appears sufficiently distinct from *D. verrucosum*, Bailey, as shown in the figure, and those of Rev. F. Wolle, Desm. U. States. With slight inflation at point of juncture. Length 200–330 μ; breadth 25–35 μ; width of apex 16–24 μ.

D. ANNULATUM, n. sp. (Plate XXV. fig. 13.)

D. mediocre, diametro 10–11-plo longius, basi paulo majore: semicellula crenulationibus 12–14 ornata seriem regularem projectionum annularum sistentibus: membrano incolore, distincte punctato: apice truncato, leviter angustato, sæpe dentibus brevibus obtusis instructo. Longit. 235 μ, latit. suturæ 25 μ, latit. apicis 16 μ.

Medium size; 10–11 times longer than wide, with slight enlargement at base; semicell with 12–14 crenulations, forming a regular series of annular projections; membrane colourless and distinctly punctate; end truncate, slightly narrowed, frequently furnished with short blunt teeth. Length 235 μ; width at suture 25 μ; width at apex 16 μ.

D. BURMENSE, n. sp. (Plate XXV. fig. 14.)

D. magnum, diametro 15–20-plo longius: semicellula profunde constricta, constrictionibus 11–12: nulla extra basin inflatione: puncto junctionis haud valide notato: apicibus truncatis, leviter angustatis, dentibus 8–10 brevibus obtusis instructis: membrano tenui, indistincte punctato. Longit. 660–850 μ, latit. ad basin 35 μ; apicis latit. 20–27 μ.

Large; 15–20 times longer than broad, having in semicell 11 or 12 deep constrictions; no extra basal inflation; point of junction not strongly marked; apices truncate, slightly narrowed, and furnished with 8–10 short blunt teeth; membrane thin, indistinctly punctate. Its nearest resemblance is to *D. constrictum*, Bailey, from which it differs in its greater length, undulate habit, and attenuated apices. Length 660–850 μ; width at base 35 μ; width at apex 20–27 μ.

D. CORONULATUM, *Grun.*

Abundant. Often joined in long filaments. Showing points of junction and covering of apex (Pl. XXV. figs. 16 & 17).

D. MINUTUM, *Naeg.*

14. TRIPLOCERAS, *Bailey.*

T. GRACILE, *Bailey.*

15. Closterium, *Nitzsch.*

C. Dianæ, *Ehrenb.*

C. costatum, *Corda.*

C. Ensis, *Delponte.*

C. Bacillum, n. sp. (Plate XXII. figs. 4, 5, & 6.)

C. robustum, fere rectum, diametro 6–10-plo longius, cylindricum: apicibus plus minus attenuatis, conos obtusos sistentibus: membrano crasso, lævi, in adulto pulchre pallido-ochraceo: lineis mediis 2–3 apud punctum junctionis. Longit. 200–235 μ, latit. 24–35 μ.

Stout, nearly straight; 6–10 times longer than wide, cylindrical; apices more or less attenuated, forming obtuse cones; membrane thick, smooth, in maturity of a fine delicate ochre; 2 or 3 median lines at point of juncture. Nearest to *C. didymotocum*, Corda, and *C. antiacerosum*, De Notaris. Length 200–235 μ; width 24–35 μ.

C. lagoense, *Nordst.*

C. striolatum, *Ehrenb.*

C. lineatum, *Ehrenb.*, f. sandvicensis, *Nordst.*

C. Ralfsii, *Bréb.*

C. acerosum, *Schrank.*

C. setaceum, *Ehrenb.*

C. juncidum, *Ralfs.*

C. Venus, *Kütz.*

C. intermedium, *Ralfs.*

C. incurvum, *Bréb.*

C. acutum, *Bréb.*

C. Leibleinii, *Kütz.*

C. porrectum, *Nordst.*

C. subtile, *Bréb.* Conjugated with quadrate zygospores.

C. nematodes, n. sp. (Plate XXII. figs. 7, 8, & 9.)

C. lanceolatum, diametro 10–11-plo longius, sensim curvatum, centro haud inflatum, striis tribus transversis, apicibus paulo utrinque dilatatis, inflationem prominentem ovatam ferentibus, ultra abrupte attenuatis: membrano crasso, flavido-fusco, longitudinaliter striato, striis 18–20. Longit. 187 μ, latit. 20 μ, latit. ad inflationem 13 μ.

Lanceolate; 10–11 times longer than wide, gradually curved, no central inflation; apices slightly dilated on both sides; beyond suddenly attenuated; central part with 3 transverse striæ; membrane thick, yellowish brown, marked longitudinally with 18–20 striæ. It comes near to *C. lagoense*, Nordst., but is of a more slender habit, and has the incrassate apical lobes. Length 187 μ; width 20 μ; width at inflation 13 μ.

16. PENIUM, *Bréb.*

P. DELICATULUM, n. sp. (Plate XXV. figs. 9 & 10.)

P. parvum, subcylindricum, duplo et ultra longius quam latum, utroque latere medii leviter emarginatum: semicellulis apice conicis, membrano interiore valde attenuato, minute regulariter punctato. Longit. 63 μ, latit. 26 μ.

Small, subcylindrical, rather more than twice as long as wide; on both sides of middle slightly emarginate; semicells conical at end; much attenuated inner membrane minutely and regularly punctate. Length 63 μ; breadth 26 μ.

P. MARGARITIFERUM, *Ehrenb.*

P. SPIROSTRIOLATUM, *Barker.*

P. DIGITUS, *Bréb.*

P. LAMELLOSUM, *Bréb.*

P. (CYLINDROCYSTIS) BREBISSONII, *Menegh.*

P. CLOSTERIOIDES, *Ralfs.*

P. MINUTISSIMUM, *Nordst.*

P. NAVICULA, *Bréb.*

EXPLANATION OF THE PLATES.

PLATE XXII.

Figs. 1 & 2. *Sphærozosma pulchrum*, Bailey, β. *trilobum*, n. var.: 1, filament, ×400; 2, end of filament seen crossways.

3. *Desmidium quadratum*, Nordst.; conjugated zygospores, ×400.

4, 5, & 6. *Closterium Bacillum*, n. sp., ×200.

7, 8, & 9. *Closterium nematodes*, n. sp.: fig. 7, ×300; and 8 & 9, ×400.

10 & 11. *Micrasterias Crux-melitensis* (Ehrenb.), Ralfs, var. n. f., ×300.

12. *Micrasterias Lux*, n. sp., ×300.

13. *Micrasterias apiculata*, Menegh., n. f.

14. *Micrasterias euastroides*, n. sp., ×300.

PLATE XXIII.

Figs. 1 & 2. *Euastrum serratum*, n. sp.: 1, cell, ×600; 2, side view of same, ×300.

Figs. 3, 4, & 5. *Euastrum flammeum*, n. sp.: 3, cell, ×600; 4, end view, ×300; 5, side view, ×300.

6 & 7. *Euastrum truncatum*, n. sp.: 6, cell, ×600; 7, side view.

8 & 9. *Euastrum divergens*, n. sp.: 8, cell, ×450; 9, cell, ×600.

10. *Euastrum coralloides*, n. sp., ×600.

11, 12, & 13. *Euastrum binale*, Turp., n. f. *crassum*: 11, cell, ×500; 12 & 13, ×2000.

14 & 15. *Euastrum retrorsum*, n. sp.: 14, cell, ×400; 15, side view.

16, 17, & 18. *Euastrum exile*, n. sp.: 16, cell, ×900; 17, side view, and 18, end view, ×900.

19 & 20. *Euastrum obesum*, n. sp., ×330 and 300.

21. *Staurastrum saltans*, n. sp., ×500.

22 & 23. *Staurastrum cyathoides*, n. sp.: 22, front view, ×300; 23, end view, ×400.

24. *Staurastrum sexangulare*, Bulnh., n. var., ×400.

25, 26, 27, & 28. *Staurastrum bifurcum*, n. sp.: 25 & 26, ×600; 27 & 28, ×300.

Plate XXIV.

Figs. 1 & 2. *Staurastrum platycerum*, n. sp., ×400.

3. *Staurastrum horrescens*, n. sp., ×400.

4 & 5. *Staurastrum granulatum*, Reinsch, ×400.

6 & 7. *Staurastrum furcatum*, Ehrenb., *β. senarium*, Ehrenb.: 6, front view, ×600; 7, upper markings.

8 & 9. *Staurastrum bifidum*, Ralfs, var.: 8, end view, ×600; 9, side view, ×450.

10, 11, & 12. *Arthrodesmus Incus*, Menegh., vars.: 10 & 11, ×400; 12, ×300.

13. *Arthrodesmus subulatus*, Kurz, n. var. *gracilis*, ×400.

14. *Arthrodesmus arcuatus*, n. sp., ×300.

15. *Arthrodesmus apiculatus*, n. sp.

16. *Xanthidium antilopeum*, Kütz., f. *angulatum*, n. var., ×400.

17 & 18. *Cosmarium cuneatum*, n. sp.: 17, cell, ×600; 18, oblique view of semicell, ×600.

19. *Cosmarium Botrytis*, Menegh., f. *indicum*, n. var., ×400.

20. *Cosmarium pardalis*, Cohn, f. *minor*, n. var., ×400.

21–25. *Cosmarium armatum*, n. sp.: 21, cell, ×500; 22, cell, ×900; and 23, ×600.

26 & 27. *Cosmarium inornatum*, n. sp., ×600.

28 & 29. *Cosmarium incisum*, n. sp., ×600.

30–34. *Cosmarium Euastron*, n. sp.: 30, cell, ×450; 33, stellate arrangement of granules; 34, side view of granules.

Plate XXV.

Figs. 1 & 2. *Cosmarium exasperatum*, n. sp.: 1, front view, ×600; 2, end view, ×600.

3 & 4. *Cosmarium spinosum*, n. sp.: 3, cell, ×450; 4, end view.

Figs. 5 & 6. *Cosmarium bifarium*, n. sp.: 5, cell, ×900; 6, end view.
7. *Cosmarium Diadema*, n. sp., ×450.
8. *Cosmarium capax*, n. sp., ×300.
9 & 10. *Penium delicatulum*, n. sp., ×450.
11 & 12. *Docidium granuliferum*, n. sp.: 11, cell, ×300; 12, granules, ×1000.
13. *Docidium annulatum*, n. sp., ×300.
14. *Docidium burmense*, n. sp., ×300.
15. *Docidium tessellatum*, n. sp., ×300.
16 & 17. *Docidium coronulatum*, Grun.: 16, junction of cells, ×300; 17, apex of cell, ×400.

Eocene Ferns from the Basalts of Ireland and Scotland.

By J. Starkie Gardner, F.L.S., F.G.S.

[Read 7th May, 1885.]

(Plate XXVI.)

I feel hardly justified in bringing a communication before you based on such very meagre material. I have only been able to get together, from all sources, five varieties of fern, and these consist of poorly preserved and almost unique fragments; they nevertheless represent, so far as the ferns, a great number of expeditions to County Antrim and to Mull, and much diligent collecting there, and contrast favourably with any brought from the other extremities of the formation in which they occur.

Two, those from Glenarm and Ballypalady, are from the lowest stage but one, palæontologically, of the basalts, and belong, I believe, to almost the oldest known Eocene. One is new to science and the other recorded for the first time from Great Britain.

One, from Mull, is from, palæontologically, the lowest stage of the basalts. The others, from Lough Neagh, are from a vast series of deposits, synchronous, I believe, with those of Bovey Tracey, and representing the latest stage of the Eocene preserved in the north of our Isles. Attention has already been called to these latter by Mr. W. H. Baily in the 'Reports' of the British Association.

Except the two from Lough Neagh (figs. 8 & 9), which belong respectively to the Geological Survey of Ireland and to Canon Grainger, F.G.S., the specimens were collected by means of the Government Grant in aid of research, and will be deposited in our National Museum.

I am afraid, from a botanical aspect, that their interest is not great; but, geologically, they supply data of considerable value towards fixing the relative age of one of the most remarkable formations in the world, and not less important because entirely destitute of fossil remains save and except plants. I allude to the enormous basaltic formation of the North-east Atlantic, which once stretched, there is every reason to believe, continuously from Antrim through the Faroës and Iceland to Greenland.

GLEICHENIA HIBERNICA, sp. nov. (Plate XXVI. figs. 5–7.)

Eocene basalts, Glenarm and Ballypalady, County Antrim.

Pinnæ narrow oblong, acuminate, with probably entire and even caudate apices, length 10 centim., breadth 4 centim., cut down within a short distance of the rhachis into numerous linear lobes, 30 millim. in extreme length and 5 to 6 millim. broad. The lobes are at angles of 50° to 60° with the rhachis, obtuse or subacute, opposite near the base and alternate higher up the pinna. Rhachis prominent, slender, glabrous; primary veins of the segments undulating, directed alternately towards each bundle of veinlets. The lowest veinlets fork once and extend to the margin of the sinus. The veinlets are fine and grouped in fasciculi, simple at first and starting at an angle of 55°, they divide into 3, the outer simple and the central one forked; though sometimes two, at times all three of the veinlets fork. The venation becomes more simple towards the apices. The margins of the segments seem faintly undulate. The species seems to have been rigid, and the texture coriaceous. Below the last segment is a small ear-like expansion in one of the specimens, destitute of midrib but traversed by forked veinlets.

The sori were removed before the pinnæ became imbedded, but their position is defined by a small narrow elliptical scar, situated near the base of the most forward—that farthest from the midrib—of the secondary veinlets of each fasciculus (fig. 7), though where these are more complex, near to the bases of the pinnules, the scars occur on both the outside veinlets instead of on one. Their position leaves no doubt as to the genus in which the fossil should be placed, and the whole habit agrees with the *Mertensia* section of *Gleichenia*, and especially with *G. dichotoma*, a native, according to Sir W. Hooker, "of tropical and subtropical regions, almost universal in the New and in the Old Worlds, Pacific

Islands, and as far north as Japan." The frond seems to have been dichotomous, for fig. 5 appears to represent parts of two basal pinnæ, while 6 may be a terminal one.

A species belonging to the same section of *Gleichenia*, with very similar pinnæ, occurs in the Middle Eocene of Bournemouth, but is distinguished by the conversion of some of its pinnæ into hook-like tendrils, differing from those of any existing fern. No other Tertiary fossil species at all resembles it except one from the very ancient Eocene of Sezanne; but similar species existed in the late Cretaceous of Aix-la-Chapelle. The Bournemouth species is almost limited to a small patch, only a few yards in extent; but the Irish species seems to have been spread rather widely, having already been found at two localities many miles apart. These seem, however, to have been near its northern limits, for it has never been found among the numerous fossil floras met with in this basaltic formation nearer to Arctic regions.

The genus *Gleichenia* seems to have reached its culminating development in Europe in Cretaceous times, and thenceforward to have rapidly disappeared.

The likeness between the fossil and its living representative falls short of specific identity. So vast an interval has elapsed that the marvel is that the growth and venation of any fern should have continued, while all else around it has progressed, without modification. We have examples of such, however, in *Chrysodium vulgare, Osmunda javanica, Onoclea sensibilis.* Other Eocene species are only separated from their living allies by trifling characters: among these is the *Gleichenia* like *G. dichotoma*, but with a climbing habit, and close allies of *Pteris cretica* and *Lygodium palmatum*, a *Phymatodes*, and an *Adiantum.* In the latter category must the Irish *G. hibernica* be placed; though at any moment specimens gathered from a fresh locality may show a closer agreement, amounting, perhaps, to identity, absolute and complete.

No other Tertiary fossil can readily be confounded with it. The few specimens I possess from Glenarm were found close together during my last day's work there. Mr. Stewart obtained a specimen from Ballypalady in which only the rhachis and midribs remained distinct, and I possess another in the same matrix in which some of the veinlets are faintly discernible.

GLEICHENIA, species indeterminable. (Plate XXVI. figs. 10 & 11.)

Eocene basalts, Ballypalady, Antrim.

The pinnules are narrow oblong, 5 millim. wide, and cleft in segments down to the midrib. These segments are somewhat falcate, at an angle of 55° with the midrib and barely 2 millim. across. The midrib is slender and prominent, but the rest of the venation is obscure. A simple veinlet can be traced on each segment, and here and there secondary veinlets diverging from it; though the matrix is too coarse to retain very delicate impressions.

The remains of this fern are of the scantiest description, no more than two fragments of pinnules, barely 15 millim. long, being known to me. These are traced out in yellow on the deep brown matrix, the outline being comparatively sharp. This colouring is rarely met with; I have only seen it in *Nelumbium Buchii* and one or two other leaves, and I am inclined to interpret its presence as an indication that the leaves possessed a thick, but not coriaceous texture.

It would be useless to attempt any generalizations upon such material. There is, however, one fact too significant to be entirely passed by. This is, that while innumerable examples of this type are met with in the so-called Cretaceous floras with Dicotyledons of America, Europe, and Greenland—such as *Gleichenia Kurriana*, Heer, which is indistinguishable from it, and in the Heersien flora *Benitzia minima*, Sap., and even in Eocenes of so late a date as the Woolwich beds—not the remotest trace of any fern resembling it, so far as I know, has yet been brought to light from any of the later Eocene beds of Europe*. Trifling as it may be, its occurrence in the Antrim basalts accords with the views I have advanced, and supported by, I believe, irresistible evidence, as to the great antiquity of this vast basaltic formation.

ONOCLEA HEBRIDICA, *J. S. Gardn.* (Plate XXVI. figs. 1–4.)

Filicites hebridicus, *Ed. Forbes, Quart. Journ. Geol. Soc.* vol. vii. p. 103, pl. 2. fig. 2 (1851).

Eocene basalts, Isle of Mull.

There are no known characters by which this fern can be definitely distinguished from the living *Onoclea sensibilis*. It is a question whether the fossil should be allowed to retain the specific name given by Edward Forbes, who described it without being aware of its close relation to an existing species: or whether we should follow Prof. Newberry, who has united a later and more robust species, from North-American Tertiaries, with the living one. The former course appears preferable, at least provisionally. The pinnæ are exceedingly variable as in the existing species, both as regards their cutting and venation—fig. 1, from near the base, and fig. 2, from the apex of a frond, representing two of the extremes. The slender stipes, from 1 to 2 feet and more in length, which are seen crossing some of the slabs recently obtained from Mull, appear to be grooved and glabrous. The fertile frond is identical with those of *O. sensibilis* (fig. 4), except that the sori are somewhat smaller (fig. 3). A soft texture is indicated in the fragmentary state in which the fossil is usually found, and the character of the impressions in the shale points in the same direction.

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* I have since ascertained that it reappears, possibly after an enormous interval, in the Oligocene of Gurnet Bay, Isle of Wight.

The discovery of this *Onoclea* at Mull is particularly interesting, since it has as yet not been met with elsewhere in Europe. It is limited to the upper layer, about a foot thick, of the black shaly leaf-bed at Ardtun Head, where much macerated fragments occur in some abundance, in company with a large palmate leaf, compressed reeds, and *Equisetum*. The bed is fluviatile, and seems to have been formed alongside a river, in a swamp liable to inundation, similar to the Tilbury flats before their level was raised. The age of these beds has not been ascertained with any certainty; but after a careful review of both the stratigraphical and palæontological evidence, I can no longer hesitate to regard their horizon as at least as old as the Lower Eocene, and probably below that of the Thanet Beds.

The fossil *Onoclea* is not exclusively confined to Mull; it has also been brought from Atanekerdluk, in Greenland, by Mr. Whymper, in an equally macerated condition. It was at first named *Woodwardites arcticus* by Heer; but Dr. Newberry subsequently pointed out its true affinity, and it is satisfactory to know that the identification of the Mull and Greenland specimens is supported by one of the highest living authorities on fossil plants, the Marquis de Saporta. Along with fragments with copiously anastomosing venation, named *Woodwardites*, are others of more robust aspect and much simpler venation, originally named *Pecopteris Torellii*, Heer, but afterwards corrected by Heer, first to

Hemitelites, and finally to *Osmunda Torellii*, Heer. It seems probable that these may belong to a variety of the same fern, such as the one found in the Fort Union Group of Dakota, and still found living in the United States. The Fort Union Group is a freshwater series considered by American geologists to belong to the Eocene Formation, containing numerous plants, among them being *O. sensibilis* in considerable abundance. The type of this fern met with in it is more robust than any living, or than the fossils met with in the older localities; and it is perhaps worth mentioning, without entering into the merits of the question here, that I am inclined, if not to doubt the Eocene age of the deposit, to regard it as a very late member of the formation. These specimens were collected by Dr. Hayden and are finer than any obtained elsewhere. In speaking of them Prof. Newberry remarked, "there is little room for doubt, therefore, that during the Miocene age a species of *Onoclea* (*Euonoclea*) flourished in the interior of our continent, of stronger habit than either of the living varieties, and holding a middle position between them." He seems to regard its horizon in the United States as Miocene, and living it is quite common at the present day.

Like so many other species and genera of Ferns and Coniferæ, whose characters are so sharply defined that they appear to have no affinities with other existing species, *Onoclea sensibilis* is a survival from a flora belonging to a past so remote that nearly all its companion species have become extinct or modified beyond specific recognition. We are far from able to trace its pedigree; but we at least know that in Mull it once occupied a station separated by thousands of miles from its nearest existing habitat. It either once ranged synchronously from America through Europe to its present habitats on the temperate coasts of Asia, having since died out in the intermediate areas, or it emigrated from some original home to the Amur and Japan, and, *viâ* Europe and Greenland, to America. Its limited palæontological range lends little support to the former theory, but is not opposed to the latter. Prof. Newberry thinks that it had an American origin; but it is clearly found in older rocks in Scotland and Greenland than in the United States. With such slender data speculations are scarcely warranted; but a satisfactory interpretation of the known facts would be, that we had a well-developed ancestral form of *Onoclea sensibilis*, relatively small and fragile, established in Mull during the cooler

Lower Eocene period; that the increasing temperature drove it north; that once established in the latitude of Greenland, it followed the then existing coast-line across the Atlantic; and, lastly, descended into America when the decreasing temperature of the Miocene rendered a southerly move imperative. It seems to have increased in size and strength, and, as a recent fern, is described by Newberry as varying "in the size, outline, and nervation of the sterile frond, from 6 inches to 3 feet in height, from a finely reticulated to an open dichotomous nervation; from a bipinnate frond with remote obovate pinnules to a pinnate form with wave-margined pinnæ and broadly alate rhachis." He has named the American fossils *Onoclea sensibilis fossilis*, finding that the recent species "plainly includes all the characters of the fossils before us"*. It adapts itself to a considerable range of temperature, growing in America from Florida to Canada, and in Asia from the Amur to Japan and Manchuria. Further descriptions and illustrations of the American fossils by Prof. Newberry are to be published.

The Ferns from the Lough-Neagh deposits belong to an altogether different and much newer horizon. The palæontological evidence, so far as it is available, points conclusively to the Middle or Upper Eocene as likely to be about their true age, while the stratigraphical evidence warrants us, I believe, in including them in the Eocene basaltic formation.

It is very significant that these, occurring in a later formation, should present us with the first instance of the occurrence of species of the English Eocene in that of North Britain; and the induction is almost irresistible that the increased temperature enabled them to occupy stations previously beyond their range. The two species are *Goniopteris Bunburii*, Heer, and *G. stiriaca*, Unger, both known in Ireland from unique specimens. The latter is one of the commonest plants at Bovey Tracey; and the former is also met with there, as well as more frequently towards the upper part of the series at Bournemouth. The Lough-Neagh deposits exhibit quite a striking analogy with those at Bovey Tracey; and were we dealing with invertebrate or vertebrate fossils instead of with fossil plants, the community of two such well-marked species as these would be regarded as conclusive evidence of the synchronism of the deposits.

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* Ann. Lyc. Nat. Hist. N. Y. vol. ix. p. 39 (April 1865).

GONIOPTERIS BUNBURII, *Heer*. (Plate XXVI. fig. 9.)
Eocene basalts, Lough Neagh.

This should be credited with a far wider range in the European Tertiaries than has previously been extended to it; but it is a type apparently rare, if not unknown prior to the Middle Eocene period. Though it comes very near in venation and outline to *Goniopteris diversifolium* and *G. tetragonum* from Brazil, the persistent absence of any traces of sori in all of the numerous specimens that I, as well as others, have come across, suggests that it would be better placed in some genus in which the fertile fronds are separate. One fulfilling these conditions and bearing an otherwise strong resemblance to it is *Onoclea orientalis*; but this differs in possessing free veinlets. The genus *Onoclea* is practically represented only by three existing species, forming respectively the subgenera *Euonoclea* and *Struthiopteris*, the former with copiously anastomosing, and the latter with free veinlets. In *Onoclea germanica* the segments are cut down, and the veinlets look as if they must unite but for this; but in some forms of the closely related *O. orientalis* the pinnules have merely waved margins, yet the veinlets never anastomose. Some principle or repulsion keeps them from contact, however nearly they may approach; yet it is quite certain that a common ancestor must at some period have united the two very distinct existing types; and the venation we are dealing with must almost of necessity have been one of the links. Genera have their rise and fall, and such a large proportion of the fossil plants I have already examined belong to genera poorly represented now, that I am predisposed to search among such for survivals of the floras of Eocene age.

The case stands thus:—As far as outline and venation go, our fern might be placed in *Goniopteris*, *Nephrodium*, *Diplazium*, *Polybotrya*, or other genera. These in a living state are separable by their sori. The fossils are destitute of any trace of sori. True, they are fragmentary, and have been floated down by water, and the sori might therefore have been so completely rubbed off as to leave no trace. The balance of probability is against this; for it is not uncommon for sori to be preserved on ferns associated with them in the very same deposits. The determination must thus be based on a nice appreciation of probabilities, and may rest on an accumulation of data which separately would be trivial and valueless. It was described as *Lastræa* by Heer.

GONIOPTERIS STIRIACA, *Unger*, sp. (Plate XXVI. fig. 8.)
Eocene basalts, Lough Neagh.

The only British locality for this species prior to its discovery at Lough Neagh was Bovey Tracey. It seems to have been local, but not uncommon there. All the fronds found were destitute of sori; but Prof. Heer considered it to be identical with a large species from the Aquitanian of Monod in Switzerland, whose fronds he estimated to have been 3 feet in length and a foot wide. From these he supplemented his diagnosis, and fixed the size, form, and position of the sori. If the identification is correct, several other supposed species should also be united with it, such as *Lastræa helvetica* and *L. dalmatica.* It is also given an Arctic range by Heer; but there seems, from the description, some little doubt as to the identity of the Greenland species with ours. A very considerable difference in the venation of pinnules from different parts of the same frond might be looked for in a species of such large dimensions, and the minute apex of a pinnule from Lough Neagh, when magnified, has a quite different aspect, and is almost exactly like *G. Bunburii* in its venation. While, however, considerable latitude would be permissible as to the extremes of venation and cutting that might safely be associated in one species, when the specimens are all from the same locality and bed, the large number of existing genera (e. g. *Acrostichum* and *Nephrodium*) in which pinnæ of this type occur should make us anxious to note even the most inconsiderable persistent differences. Thus a fern found by the Marquis de Saporta in the gypsum of Aix, Provence, appears at first glance completely identical with it; but it differs in reality in an important particular, the anastomosis of the inferior veinlets of the segment not being continued up to contact with the pair above. This peculiarity removes it from the group *G. prolifera*, Mett., of Tropical America, to which our British specimens seem very closely allied, and associates it with *G. crenata*, Mett., also of Central America and the Antilles. I may here mention a slight peculiarity in the Lough-Neagh specimen, which is, that instead of the veinlets of contiguous segments anastomosing regularly in pairs, the lower veinlet on one side, in at least some instances, anastomoses with three in succession on the other. Want of recognition of even so slight a character as that on which Saporta insists might lead to very erroneous views as to the former distribution of a species. *G. stiriaca* seems to have been a fern requiring a relatively moderate temperature in our Eocene period; and I think temperature must have excluded it from Bournemouth, where otherwise every variety of condition favourable to fern-growth seems to have existed. Bovey was evidently a much higher station and far from the sea. This species is found in many of the relatively temperate Middle and Upper Eocene floras of Europe, and, as before remarked, possibly extended to circumpolar regions, just as *Aspidium Lonchitis* extends from Naples and Greece to Disco, the subtropical *Trichomanes radicans* to Ireland, and *Hymenophyllum* to Norway; it is also met with in the American Tertiaries. It must have been a robust fern and of somewhat coriaceous texture, the pinnules being with difficulty detached from the rhachis, and, judging from its presence in the Bovey beds, addicted to marshy stations.

Attention had already been called to this specimen by Mr. W. H. Baily. in the 'Reports of the British Association' for 1883. The stone is in the possession of the Rev. Canon Grainger, F.G.S., of Broughshane, and is quite full of fragments of pinnæ.

It was originally described as *Polypodites stiriacus* by Unger, and the generic name was altered successively to *Lastræa*, Heer, *Goniopteris*, A. Braun, and *Phegopteris*, Ettingsh.

DESCRIPTION OF PLATE XXVI.

Figs. 1–4. *Onoclea hebridica*, J. S. Gardn., Ardtun Head, Isle of Mull.
    1. Portions of pinnæ from a large frond, showing copiously anastomosing venation.
    2. Upper part of a frond with less anastomosing venation, and denticulate to entire margins.
    3. Fragment from a fertile frond with sori.
    4. Similar fragment from living *O. sensibilis*.
5–7. *Gleichenia hibernica*, J. S. Gardn., Glenarm, Antrim.
    5. Parts of a pair of probably basal pinnæ.
    6. Parts of a pair of probably apical pinnæ.
    7. Veinlets magnified, with scar of sorus.
8. *Goniopteris stiriaca*, Unger, Lough Neagh.
9. *Goniopteris Bunburii*, Heer, Lough Neagh.
10 & 11. *Gleichenia*, sp., Ballypalady, Antrim.

Figs. 1–7. Collected by the author, and deposited in the British Museum by direction of he Royal Society. Fig. 8. In the cabinet of the Rev. Canon Grainger, Broughshane. Fig. 9. In the collection of the Geological Survey, Dublin.

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END OF THE TWENTY-FIRST VOLUME.

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C.B.Clarke del.

INDIAN CYPERACEÆ.

[illegible]

10
10a
11
11a
12
13
14
15
16
17
18
19

C.B. Clarke del.

INDIAN CYPERACEÆ.

J.N. Fitch lith.

21
27
22
23
24
25
20
28
29
21

30
31
33
34
32
35
36
37
39
40
38
42
43
41
44
42a
43a

C.B.Clarke del. INDIAN CYPERACEÆ. J.N.Fitch lith.

a
b
c
8
18
15
11
14
16
17
21
22
23
24
20
25

AFGHANISTAN ALGÆ

Mintern Bros imp

C.F. White

C F White del.
Bergeau lith

1, 2, 5, ANCIENT EGYPTIAN. 3, 4, 6, RECENT POLLEN AND ANTHER OF PAPAVER RHŒAS.

Mintern Bros imp

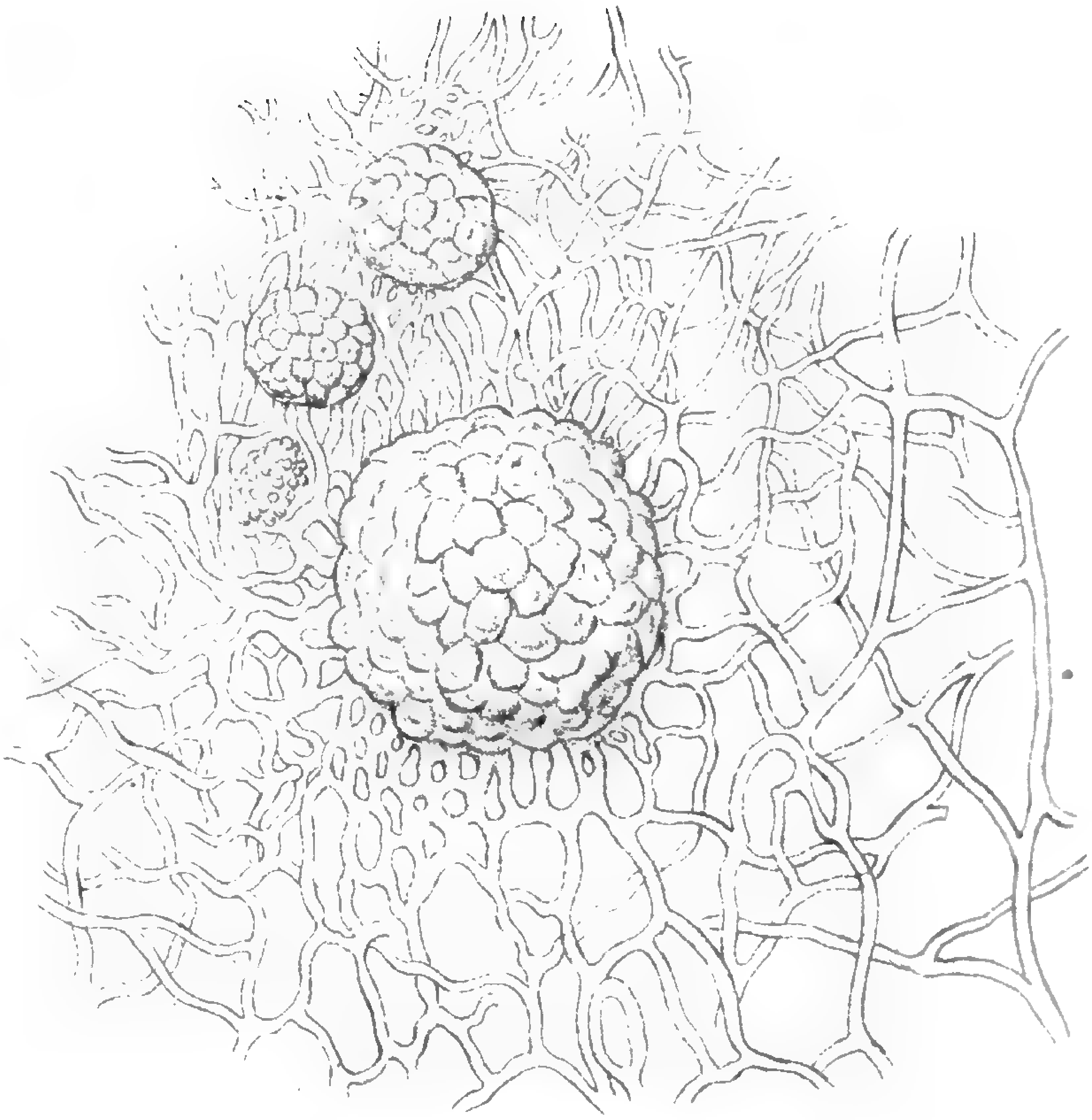
R.A.Rolfe

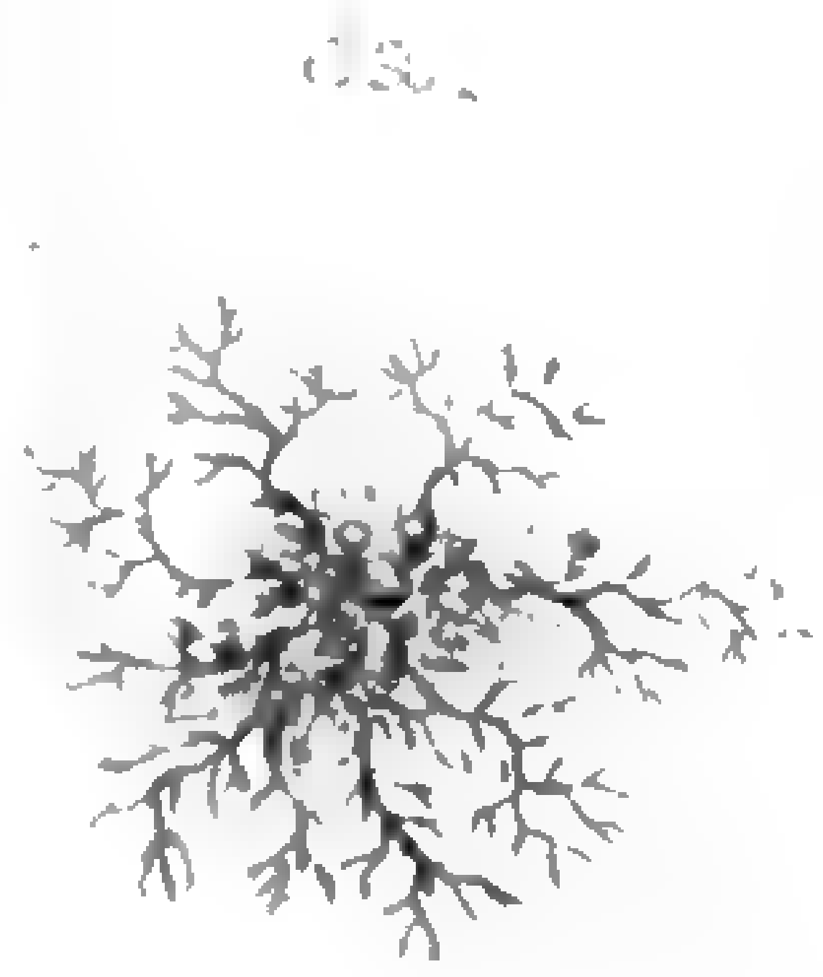
1
nat. size
2
3
4
5
6
7
8
9
11
12
a
b
d

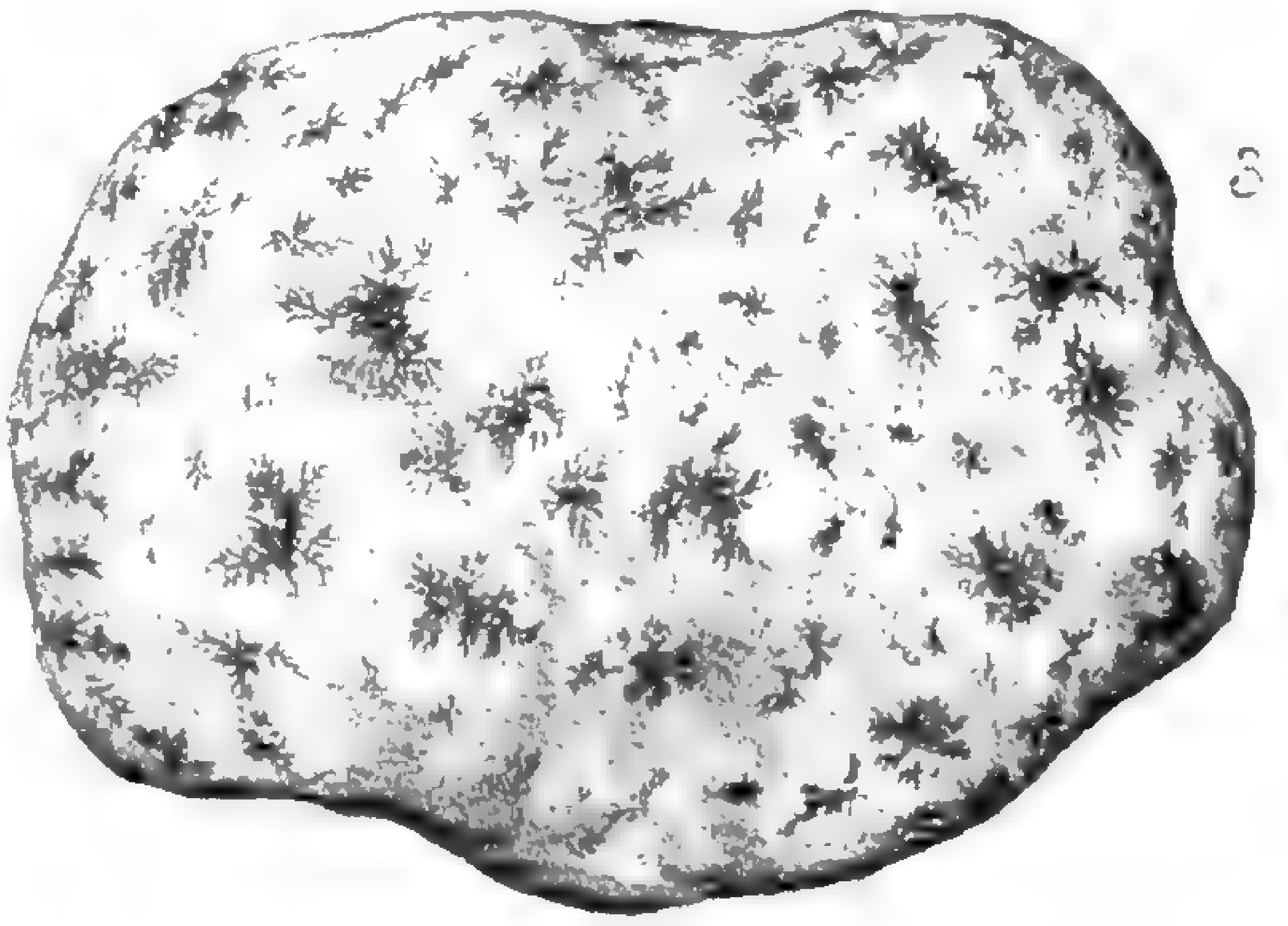
R.A.Rolfe del.
J.N.Fitch lith.

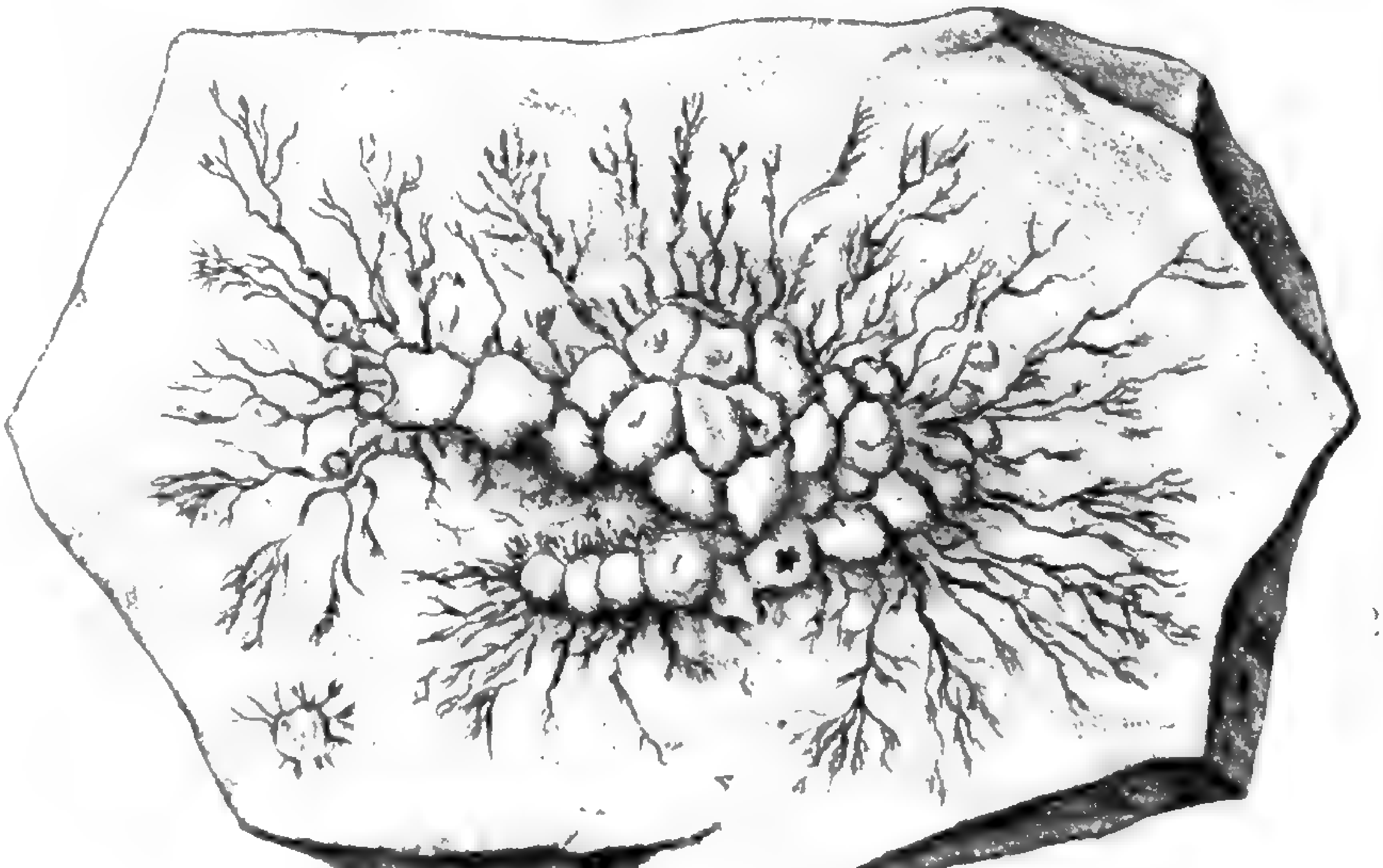
HYALOCALYX SETIFERUS, *Rolfe*.

J.N.Fitch imp.









Berjeau & Highley lith.

Mintern Bros. imp.

HYPOTHALLINE CONDITION OF LICHENS.

4a
4
6
7
7a
5
8a
8

Berjeau & Highley lith.

HYPOTHALLINE CONDITION OF LICHENS

R.A.Rolfe del.
J.N.Fitch lith.

VILLARIA PHILIPPINENSIS, *Rolfe*.

J.N.Fitch imp.

Bower

LINN. SOC. JOURN. BOT. VOL. XXI. PL. 11.

1.
st
X 325
2
a
X 325
st
3.
a
X 325.
st
4.
X 325
5
a
X 325
6
X 130
7

APOSPORY IN FERNS.
1-7 ATHYRIUM FILIX FŒMINA var CLARISSIMA

9.
×20
10
×20
8
prth
arch
vb.
×40
anth
prth
11
×325
12
×225

E Carter sc.

Mintern imp

APOSPORY IN FERNS.
8. ATHYRIUM FILIX FŒMINA var CLARISSIMA.
9-12 POLYSTICHUM ANGULARE var PULCHERRIMUM

F.C.S. Roper [illegible] Journ. Bot. Vol [illegible] Pl [illegible]

Slightly less than Nat. Size
1
2
3
200
200

[illegible] del. RANUNCULUS [illegible] LINGUA [illegible] lith. [illegible]

1 Submerged leaves, Stomata [illegible] of submerged, [illegible] Aerial leaves.

[illegible] del. [illegible] lith.

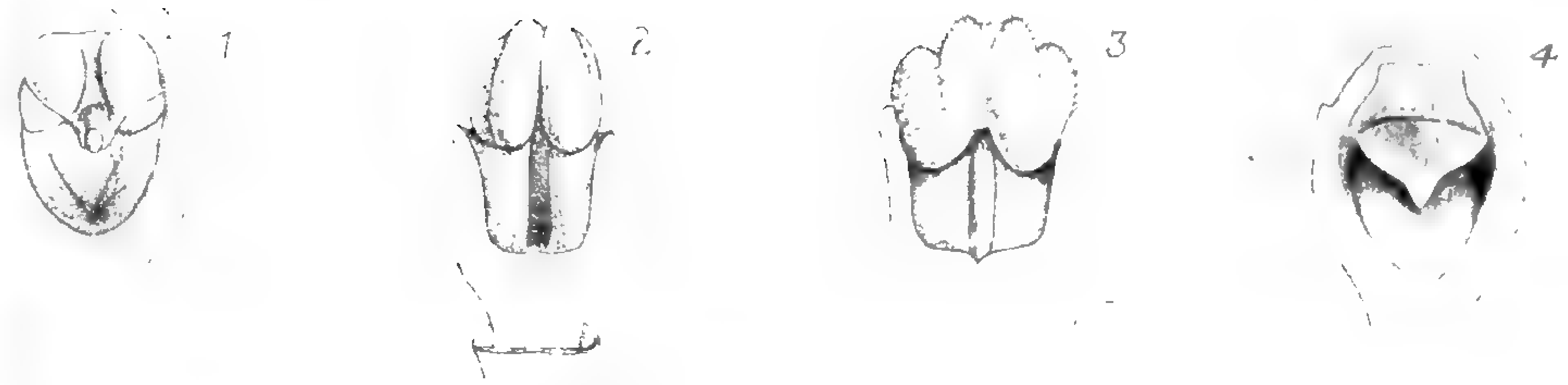
RANUNCULUS [illegible]

1 Submerged leaf [illegible] leaves

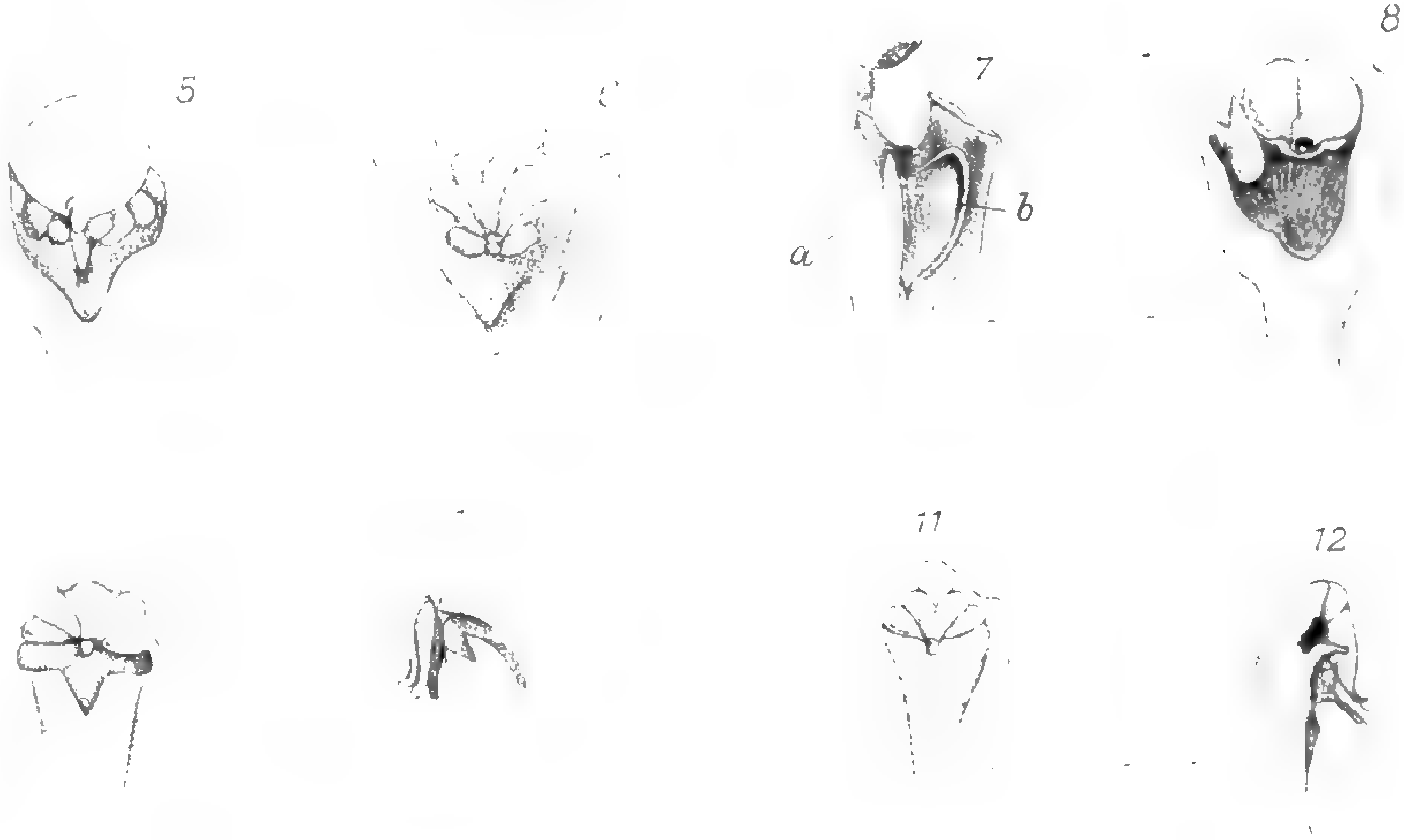
A
1
3
4
2
7
6
B
5
9
8

J.N. Fitch lith. Fitch imp.

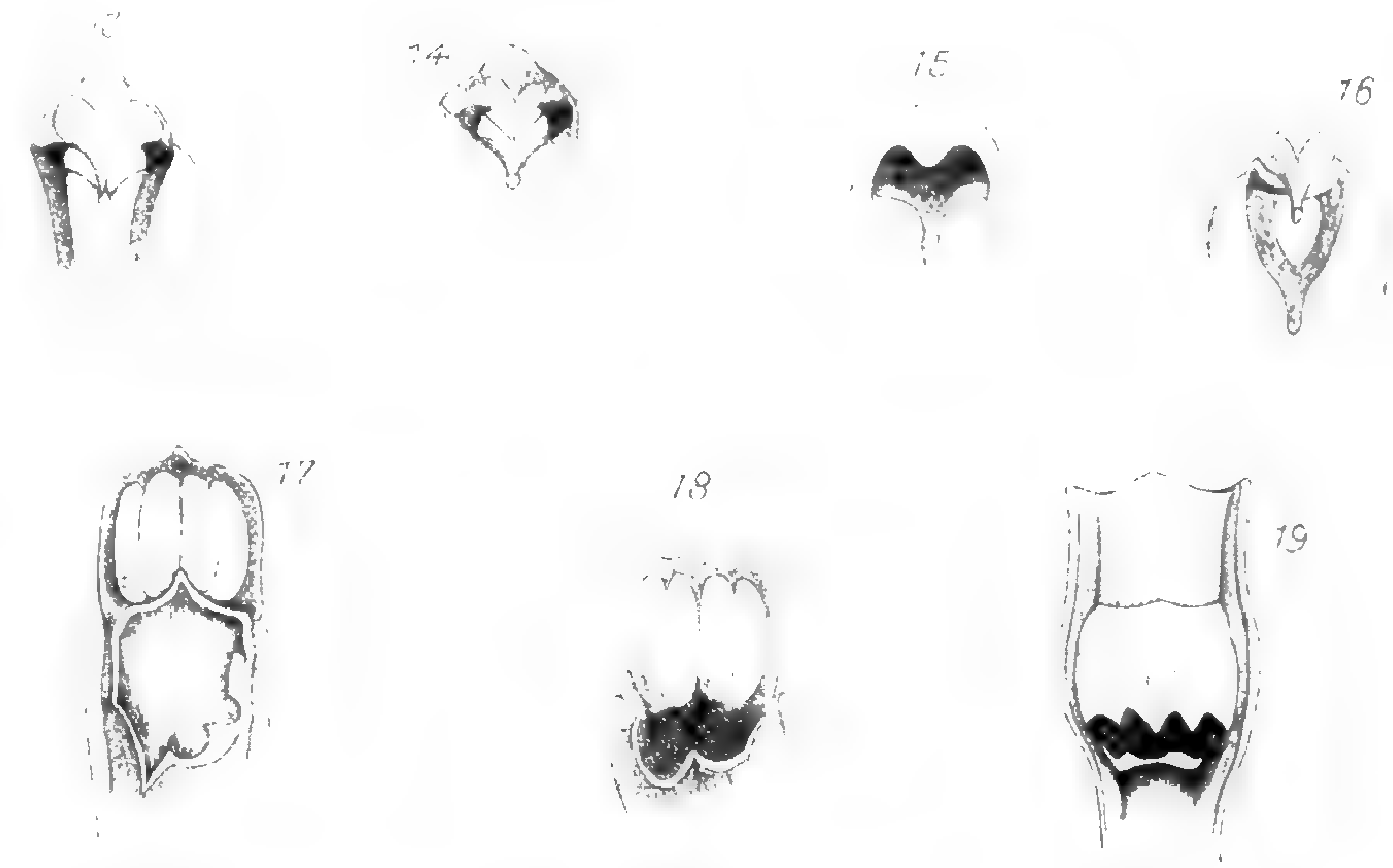
A 1-4. BICORNELLA GRACILIS. B. 5-9 B. PARVIFLORA



Phaius Blumei.


5
6
7
a
b
8
11
12

Spathoglottis plicata.


13
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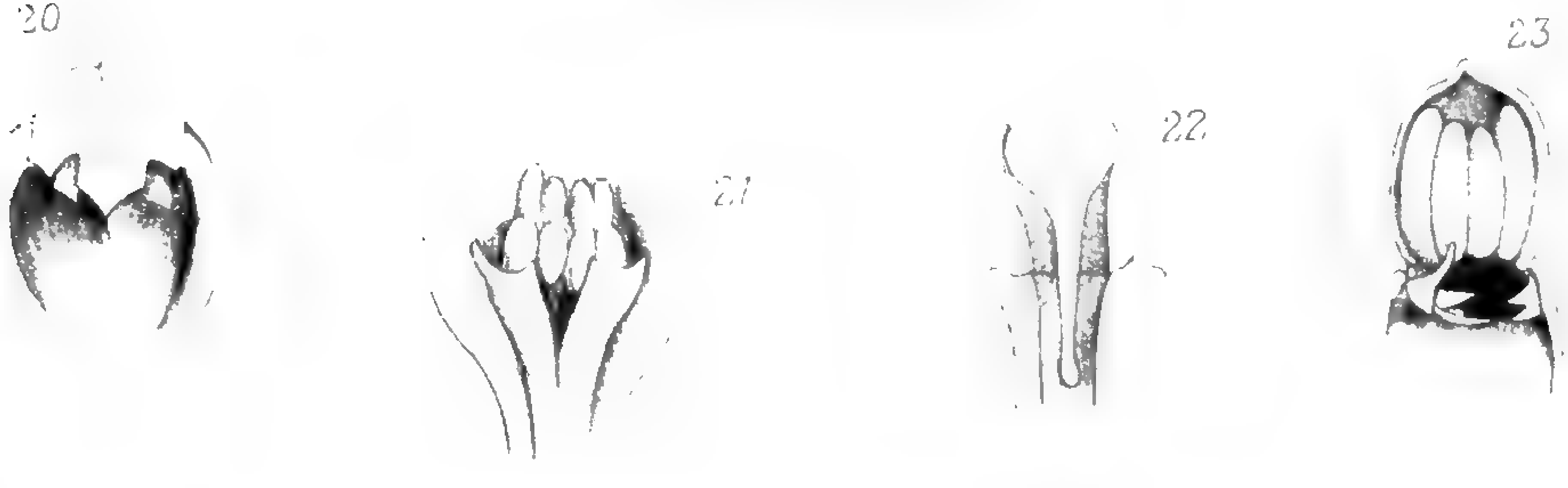
19

Arundina speciosa.



J. Forbes del.

Fitch lith.

SELF-FERTILIZATION IN ORCHIDS.

Eria, sp. near E. javensis
1
2
3
4
5
c
c
7
11
nat. size
10
9
Chrysoglossum sp.
12
13
14
Goodyera sp.

H.O. Forbes del.

Fitch lith.

SELF-FERTILIZATION IN ORCHIDS.

R. Kidston.

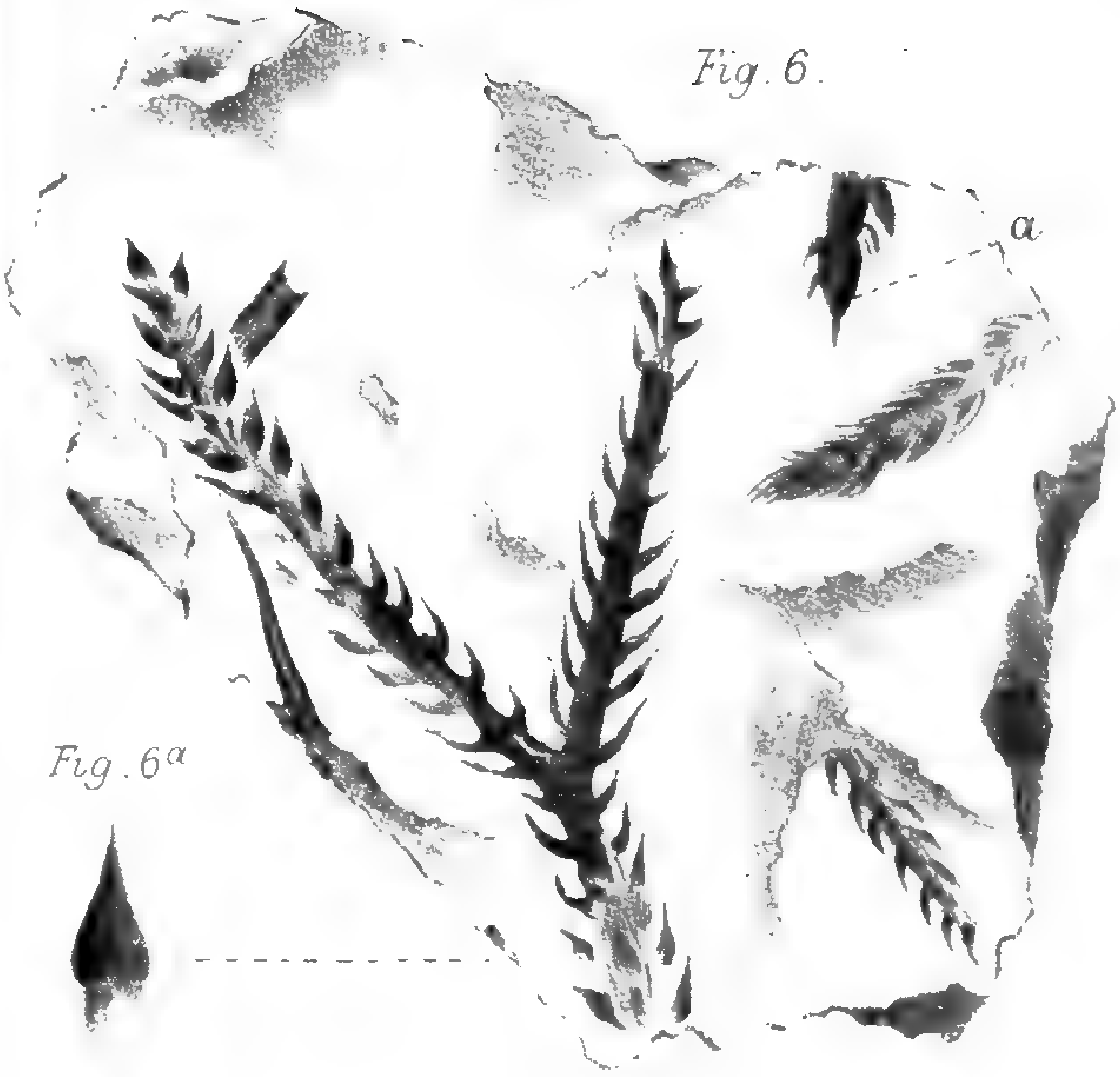


Fig. 6.

Fig. 6ᵃ

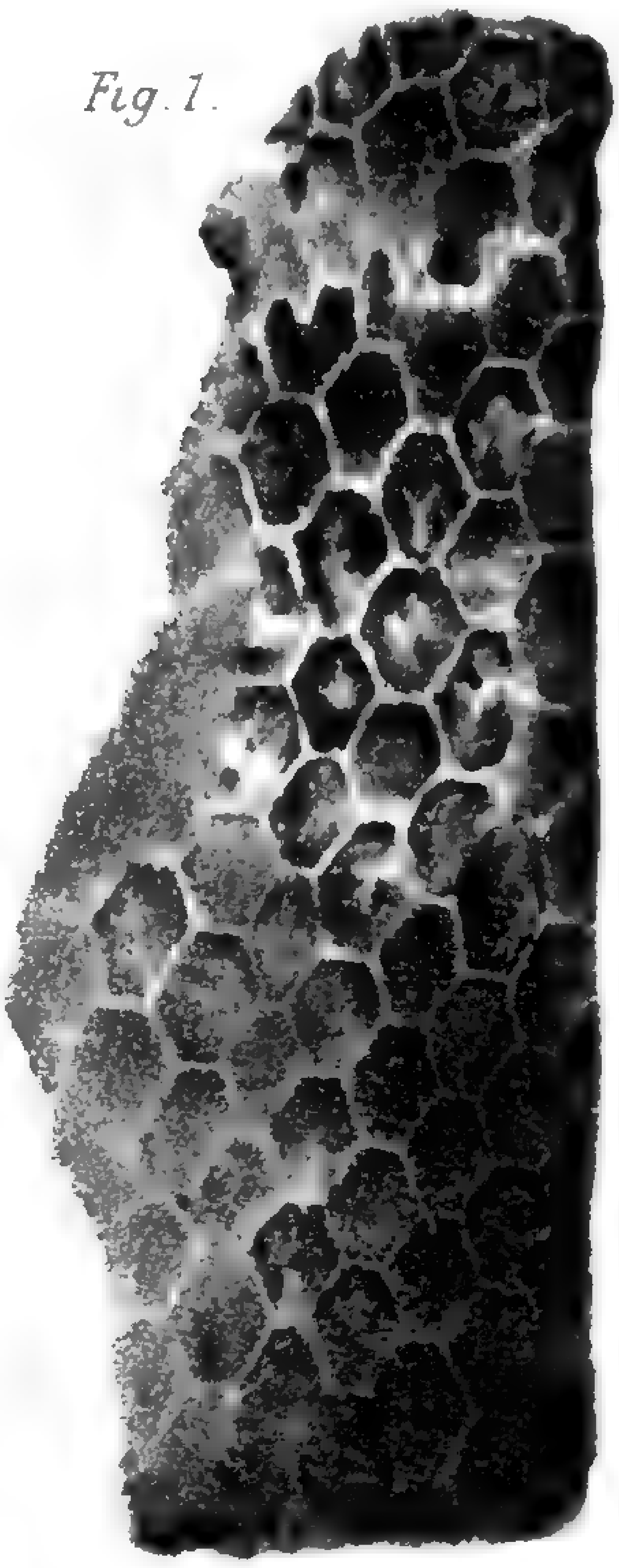


Fig. 1.

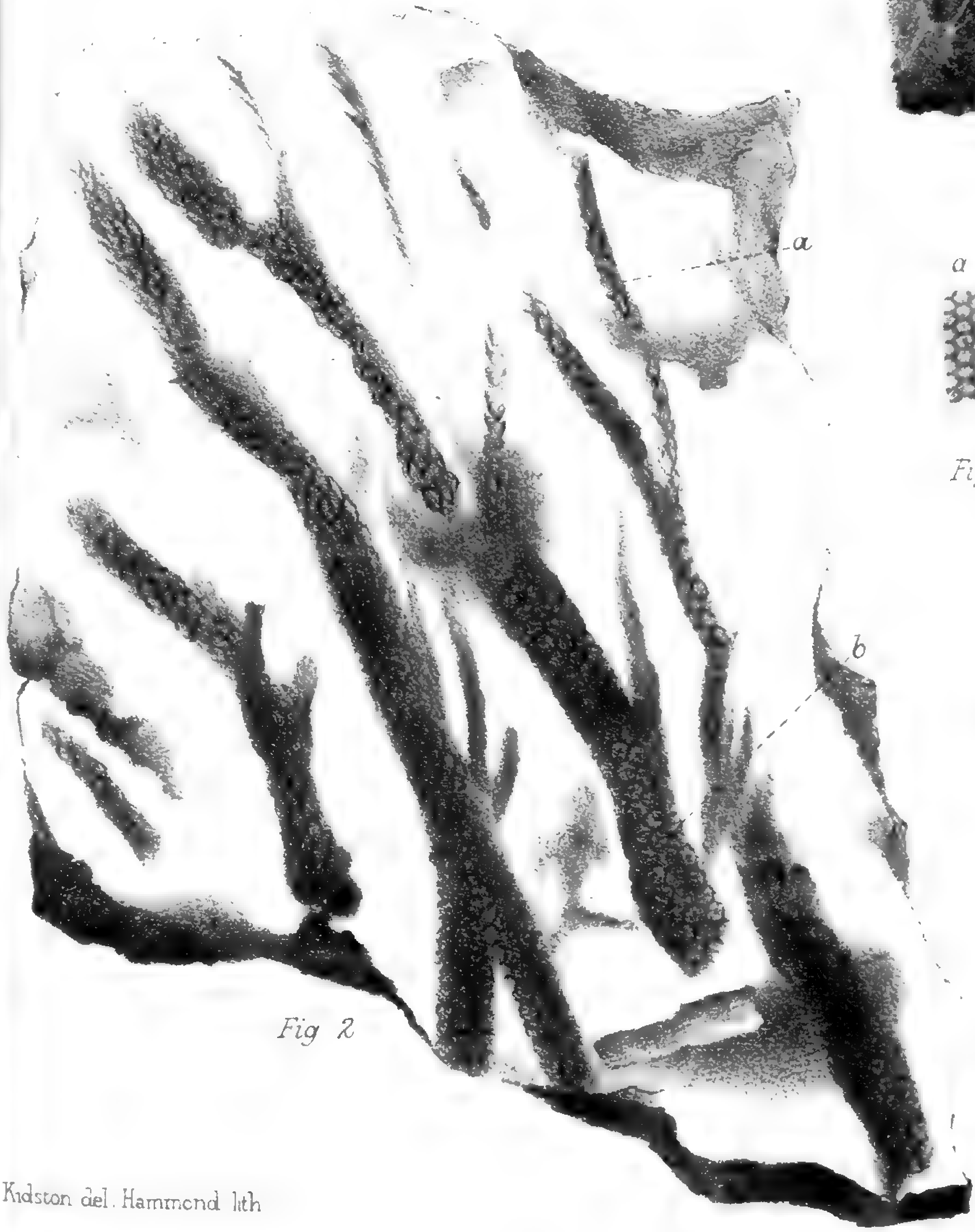


Fig 2

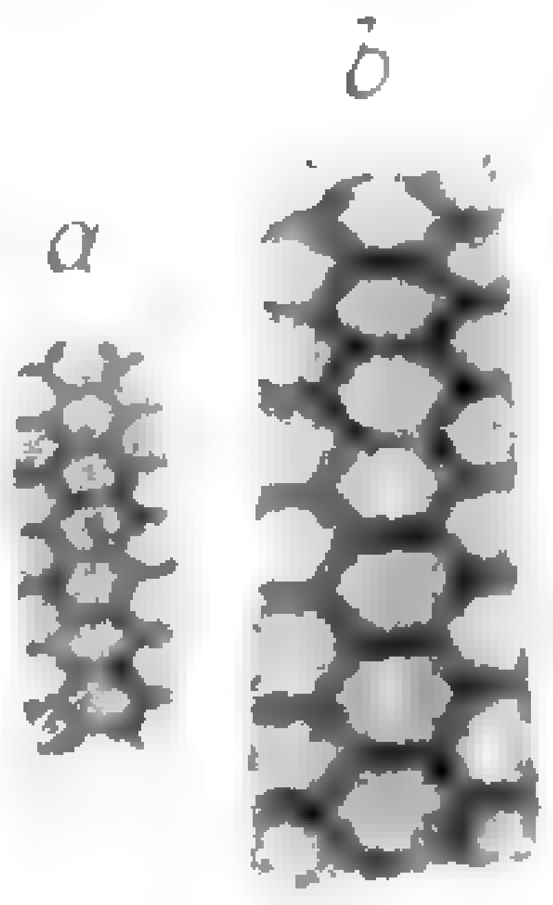


Fig 3

Fig. 5.

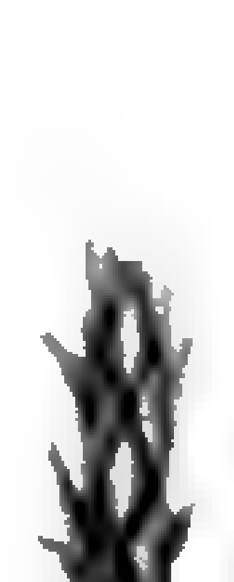


Fig. 4.

Kidston del. Hammond lith.

Hanhart imp.

LYCOPODITES VANUXEMI, *Goeppert, sp.*

1
p
2
n
3
p
4
p
6
9
p
5
p
8
7
12
15
13
10
p
11
17
16

E. Carter

CONTINUITY OF PROTOPLASM

Mintern

Spencer Moore del.

18
19
22
20
21
24
27
26a
5
23
26b
30a
25b
25a
30b
28
29a
29b
31a
31b
32a
32b
29c
33
34a
34b
35
p
s

[illegible]

CONTINUITY OF PROTOPLASM

Mintern imp.

36
s
m
p
37a
37b
38a
38b
41
40
43
46
45
42
48
39
47
53
50
49
51
52
s
56
60
57
61
59
58
54
62
55

CONTINUITY OF PROTOPLASM

1
2
3
× 400
4
5
× 200
6
7
× 800
8
9
13
14
× 800
10
11
12

[illegible]

[illegible]

Mintern Bros. imp.

W. Joshua del.

LINN. SOC. JOURN. BOT. VOL. XXI. Pl. 23.

1.
×600.
2
×300.
3.
×600.
4
×300.
5.
×300.
7
6
×600
8.
×450.
10.
×600.
11
×500
9
×600
20
×300
12
13.
×2000
19.
×330.
14
×400
15.
16.
×900.
17.
24
×400.
18.
×900.
21
×500.
23.
×400.
22
×300.
25.
×600
26
27
28.
×300.

E. Carter sc.

BURMESE DESMIDIEÆ.

Mintern Bros. imp.

W. Joshua del.

1.
X400
2.
X400.
3.
X400
4
X400
5
X400
6.
7
X600
8
X600
9
X450
10
X400.
11
X400
12
13
X400
14
15.
16
X400.
17
X600
18
X600
19
X400.
20
X400
21.
X500
22
X900.
23.
24
25
26
27.
X600
28
29
X600
30
X450.
31.
32
33
34.

BURMESE DESMIDIEÆ

E. Carter sc.

Mintern Bros. imp.

Joshua del.

LINN SOC. JOURN. BOT. VOL. XXI, Pl. 25.

1
4
3
5
6
× 450.
× 900
× 500
7
14
11
10
× 450
× 450
13
× 300
8
15
× 300
× 300
× 300
16
17
× 400
× 300
12
× 1000

rman sc.

BURMESE DESMIDIEÆ.

Mintern Bros imp.

4
3
1
2
8
7
9
11
10
6
5

Morgan lith.
West Newman imp.

1–4, ONOCLEA HEBRIDICA. 5–7, GLEICHENIA HIBERNICA.
8, GONIOPTERIS STIRIACA. 9, G. BUNBURII. 10–11, GLEICHENIA, *Sp.*